INSTRUCTION BOOK
FOR
RADIO SETS
AN/VRC-19, -19X, and -19Y

Manufactured by
MOTOROLA, INC.
Order No. 11661-Phila-52
21 March 1953

MODIFICATION NOTICE

FOR

RADIO SETS AN/VRC-19, -19X, AND -19Y

Radio Transmitter T–278/U and Radio Set Control C–847/U units bearing serial numbers 601 or higher have been modified at the factory. If a Transmitter T–278/U numbered 601 or higher is used in conjunction with a Radio Set Control C–847/U numbered from 1 to 600, the Radio Set Control must be modified. If a Radio Set Control numbered 601 or higher is used with a Transmitter numbered from 1 to 600, the Transmitter must be modified. The purpose of this modification is to standardize wiring of the handset connector, Signal Corps type U–79/U.

The modification procedure is as follows:

Radio Transmitter T–278/U (Serial No. 1 to No. 600)

1. Disconnect the bare wire running from pin No. 1 to pin No. 6 on transformer T401.
2. Add a wire lead between pin No. 6 on transformer T401 and ground.
3. Remove the wire lead running between connector P401, pin 15, and resistor R434 on terminal board TB403.
4. Add a wire lead between resistor R434 on terminal board TB403 and pin No. 1 on transformer T401.

Radio Set Control C–847/U (Serial No. 1 to No. 600)

1. Reverse the wire connections at pin 11 and pin 12 on terminal board TB1502.
2. Add a wire jumper (#20 AWG bare wire) from pin E to pin H on the handset connector J1501.
3. Disconnect the wire running from pin C on J1501 to pin 20 on terminal board TB1502.
4. Disconnect the wire at pin D of J1501 and connect it to pin C of J1501.

THIS ADDENDA WILL REMAIN IN EFFECT ONLY UNTIL THE INFORMATION IS PUBLISHED IN AN OFFICIAL DEPARTMENT OF THE ARMY PUBLICATION.

ADDENDA NO. 7

31 JANUARY 1954

ADDENDA NO. 7 TO INSTRUCTION BOOK FOR RADIO SETS AN/VRC-19, -19X, AND -19Y

The following information, published on Order No. 11661-Phila-52, provides information to be added to the instruction book in addition to that provided by Addenda No. 3, 15 June 1953, Addenda No. 4, 3 September 1953, and Addenda No. 6, 15 December 1953.

Enter suitable notations beside each affected paragraph and figure in the instruction book to indicate the presence of this supplementary information.

Page 35. Par. 44. Add paragraph 44.1 after paragraph 44.

44.1. System Alinement Procedure

Caution: Failure to follow these instructions may result in poor system performance.

a. General. In order to obtain optimum system performance when all transmitters and receivers are operated on the same frequency channel it is necessary to perform the following procedure. The purpose of this procedure is to have all receivers and transmitters in the system alined to the exact operating frequency. This is accomplished by using one of the receivers as a frequency standard when adjusting the frequency of each transmitter. All of the other receivers in the system are then alined by using one of the transmitters as a frequency standard. However, before attempting the system alinement procedure it is necessary to have each individual receiver and transmitter alined to the approximate operating frequency.

b. Checking Receiver Alinement. The following procedure should be applied to all receivers in the system. Remove the shield from the LOCAL OSC 152-174 MC plug-in unit. With a VTVM set to a suitable range, make the measurements listed in the following chart. These measurements should be made with no signal being received. The voltages listed in the nominal reading column are those of a normally alined receiver. If these voltages are not obtained, perform the adjustments recommended in the correction column. Refer to figure 7 (page 9) for adjustment locations. Turn the VOLUME-OFF switch on Radio Set Control C-847/U clockwise to apply power to the receiver. Leave the switch in this position for all subsequent steps of the procedure.

Test point		Nominal reading (volts)	Correction
From	To		
6 FIL jack	8 GND jack	1.2 to 1.5	Refer to section I of chapter 5 in the instruction book for Radio Receiver R-394/U for troubleshooting information.

Test point From	Test point To	Nominal reading (volts)	Correction
7 B+ jack	8 GND jack	140 to 180	Refer to section I of chapter 5 in the instruction book for Radio Receiver R-394/U for troubleshooting information.
Test point 1 inside oscillator plug-in unit (top terminal of right hand terminal board TB31).	8 GND jack	−4 to −8	Adjust Z31 for maximum negative voltage.
1 L.O. jack	8 GND jack	−1.5 to −5	Adjust Z32, Z33, and Z34 for maximum negative voltage.
4 2ND IF jack	8 GND jack	−.1 to −1.5	Adjust Z1, Z2, Z3, Z4, Z5, and Z6 for maximum negative voltage.
5 DISCR jack	8 GND jack	−1 to +2[a]	Refer to section I of chapter 5 in the instruction book for Radio Receiver R-394/U for troubleshooting information.

[a] Record this reading.

If the above readings cannot be obtained, complete receiver alinement will be necessary. Refer to section III of chapter 5 in the instruction book for Radio Receiver R-394/U.

c. Checking Transmitter Alinement. The following procedure should be applied to all transmitters in the system. With a VTVM set to a suitable range, make the measurements listed in the following chart. The voltages listed in the nominal reading column are those of a normally alined transmitter. If these voltages are not obtained, perform the adjustments recommended in the correction column. Refer to figure 23 (page 24) for test point and adjustment locations. Place the TUNE-OPR switch in the TUNE position. Place the TEST-OFF switch in the TEST position.

Test point From	Test point To	Nominal reading (volts) TUNE position	Nominal reading (volts) OPR position	Correction
FINAL GRID jack	Ground	−25 to −40	−40 to −80	Adjust FINAL GRID TUNE 1 for maximum negative voltage. Adjust FINAL GRID TUNE 2 for maximum negative voltage. Adjust DRIVER PLATE TUNE for maximum negative voltage. *Note.* The FINAL GRID TUNE capacitors should be adjusted to approximately equal capacity by keeping the shaft slots parallel.

If the above readings cannot be obtained, complete transmitter alinement will be necessary. Refer to paragraph 43.

d. Checking Transmitter Frequency. The discriminator balances of the receivers are used as an indication to check the frequency of the transmitter that will be used to start the system alinement procedure. Select one of the transmitters and check if its frequency is close to the frequency of the receivers by performing the following procedure.

(1) Disable the receiver squelch circuits by turning the SQUELCH controls fully clockwise. A rushing noise should be heard.

(2) Allow 5 minutes warm-up time for the receiver and transmitter crystal ovens.

(3) Place the transmitter TUNE-OPR switch in the TUNE position.

(4) Turn the TEST-OFF switch to the TEST position and make and record the following measurements for each receiver. The receivers should be quieted when the transmitter is turned on.

Test point		Nominal reading (volts)
From	To	
4 2ND IF jack	8 GND jack	−4 to −15
5 DISCR jack	8 GND jack	−3 to +4

If correct readings are obtained proceed with subparagraph *f*. If all receivers show discriminator readings too far off (negative voltage greater than −3 or positive voltage greater than +4), another transmitter should be tried. If a transmitter cannot be found that gives proper discriminator readings it will be necessary to adjust the frequency of one transmitter as follows.

e. Preliminary Adjustment of Transmitter Frequency. Remove the transmitter from the cabinet by turning the handle counterclockwise and pulling the transmitter forward out of the cabinet. Connect the transmitter to the cabinet by means of a patch cord (Special Purpose Electrical Cable Assembly CX-2371/U). If no patch cord is available refer to subparagraph *h*.

(1) Select the receiver whose discriminator reading is closest to the average of all readings obtained in the last step of subparagraph *b*.

(2) Allow at least 5 minutes warm-up time for the receiver and transmitter crystal ovens.

(3) Connect a VTVM between the DISCR and GND test points on the receiver.

(4) Turn the TEST-OFF switch on the transmitter to the TEST position.

(5) Adjust C403 or C404, figure 26 (page 32), depending on which oscillator is being used, until the discriminator reading is between 0 and +1 volt.

(6) Turn the TEST-OFF switch to the OFF position. The transmitter may now be used to perform the procedure of subparagraph *d*.

f. Final Adjustment of Transmitter Frequency.

(1) Select the receiver whose discriminator reading is nearest the average of all readings obtained in subparagraph *d*(4).

(2) Allow at least 5 minutes warm-up time for the transmitter and receiver crystal ovens.

(3) Turn the TEST-OFF switch on the transmitter to the TEST position.

(4) Adjust C403 or C404, figure 26 (page 32), depending on which oscillator is being used, until the reading at the DISCR test point is equal to the reading obtained in subparagraph *b* for that receiver (between −1 and +2 volts).

(5) Turn the TEST-OFF switch to the OFF position.

(6) Repeat steps 2 through 5 for each transmitter.

g. Receiver Frequency Adjustment. In order to aline the receivers other than the one in subparagraph *f*(1), which is already alined exactly to the transmitter signal, it is necessary to adjust the first high frequency oscillator in each of the receivers as follows:

(1) Use the transmitter which was selected for the procedure of subparagraph *d*.

(2) Connect a VTVM between the DISCR and GND test points on the receiver being alined.

(3) Allow at least 5 minutes warm-up time before proceeding with step (4).

(4) Turn the TEST-OFF switch on the transmitter to the TEST position.

(5) Adjust Z31, figure 7 (page 9) until the reading at the DISCR test point is between −1 and +2 volts.

(6) Check the voltage at the L.O. test point. The reading should be between −1.3 and −5 volts. If this reading cannot be obtained refer to the instruction book for Radio Receiver R-394/U for troubleshooting information.

(7) Repeat steps 1 through 6 for each receiver to be used in the system and all receivers will be alined to the same frequency.

h. Transmitter Alinement Without Patch Cord. If no patch cord (Special Purpose Electrical Cable Assembly CX-2371/U) is available and it is necessary to make the transmitter frequency adjustments, proceed as follows:

(1) Select the receiver whose discriminator reading is nearest the average of all readings obtained in subparagraph *d*(4).

(2) Allow at least 5 minutes warm-up time for the crystal ovens in the receiver and transmitter.

(3) Connect a VTVM between the DISCR and GND test points on the receiver.

(4) Turn the TEST-OFF switch on the transmitter to the TEST position.

(5) Record the reading obtained at the DISCR test point.

(6) Turn the TEST-OFF switch to the OFF position.

(7) Remove the transmitter from the case and remove both dust covers.

(8) If the DISCR reading was too far on the positive (+) side adjust C403 or C404, figure 26 (page 32), depending on which oscillator is used, for less capacitance (plates further open). If the reading was too far on the negative (−) side adjust C403 or C404 for more capacitance (plates further closed).

Note. Do not change the capacitor setting more than 15 degrees at a time.

(9) Put the transmitter back in the case and repeat steps 3 through 8 until the reading is within .5 volt of the desired value. The desired value is equal to the receiver discriminator voltage with the transmitter off, as in the last measurement of subparagraph *b*.

(10) Replace transmitter dust covers. The transmitter may now be considered on frequency for optimum system performance.

i. Alinement Without a VTVM. If a VTVM is not available it is possible to use a 0 to 50 microammeter for transmitter and receiver alinement. On the microampere scale the meter will read one microampere per volt at the following points: test point 1, L.O., 2ND IF, and DISCR in the receiver and FINAL GRID jack in the transmitter.

Caution: Do not use this meter at the FIL and B+ test points of the receiver; use a suitable voltmeter if available.

j. Use of Frequency Meter TS-174B/U. If a frequency standard such as Frequency Meter TS-174B/U is available the operating frequency can be checked as follows:

(1) Carefully adjust the frequency standard to the operating frequency of the system.

(2) Allow a receiver to pick up the signal radiated by the frequency standard and record the reading obtained at the DISCR test point.

(3) Turn off the frequency standard.

(4) Turn the TEST-OFF switch on the transmitter to the TEST position.

(5) Record the reading obtained at the receiver DISCR test point.

(6) Comparison of the two readings will give an additional check of the transmitter frequency. The discriminator voltage will change approximately .5 to .7 volt per kilocycle. An increase in the positive direction indicates that the transmitter frequency is low and an increase in the negative direction indicates that the transmitter frequency is high.

THIS ADDENDA WILL REMAIN IN EFFECT ONLY UNTIL THE INFORMATION IS PUBLISHED IN AN OFFICIAL DEPARTMENT OF THE ARMY PUBLICATION.

ADDENDA NO. 6

15 DECEMBER 1953

ADDENDA NO. 6 TO INSTRUCTION BOOK FOR RADIO SETS AN/VRC-19, -19X, AND -19Y

The following information, published on Order No. 11661–Phila–52, provides information to be added to the instruction book in addition to that provided by Addenda No. 3, 15 June 1953, and Addenda No. 4, 3 September 1953. This addenda supersedes Addenda No. 5, 31 October 1953.

Enter suitable notations beside each affected paragraph and figure in the instruction book to indicate the presence of this supplementary information.

Addenda No. 3. Page 5. Fig. 63.1. Add the following note to figure 63.1.

7. FILTER FL81 IS USED ONLY IN 2ND IF DISCR PLUG-IN UNITS ON ORDER NO. 11661–P–52 BEARING SERIAL NUMBERS 1 THROUGH 5550. IN UNITS BEARING SERIAL NUMBERS 5551 AND HIGHER, FL81 IS REPLACED BY INDIVIDUAL CAPACITORS AND A RESISTOR, READING FROM LEFT TO RIGHT, C111 (150 UUF), R115 (47K), AND C112 (100 UUF).

Page 2. Par. 5. In item 5, lines 1 and 4, change "15 kc" to read: 18 kc.

Page 4. Par. 6. In item 5, change "15 kc" to read: 18 kc.

Page 98. Fig. 57. Make the following changes in figure 57:

Transpose terminals 5 and 6 on relay K1201.

Transpose terminals 1 and 9 on relay K1203.

Page 102. Fig. 61. Delete figure 61 and insert a new figure 61.

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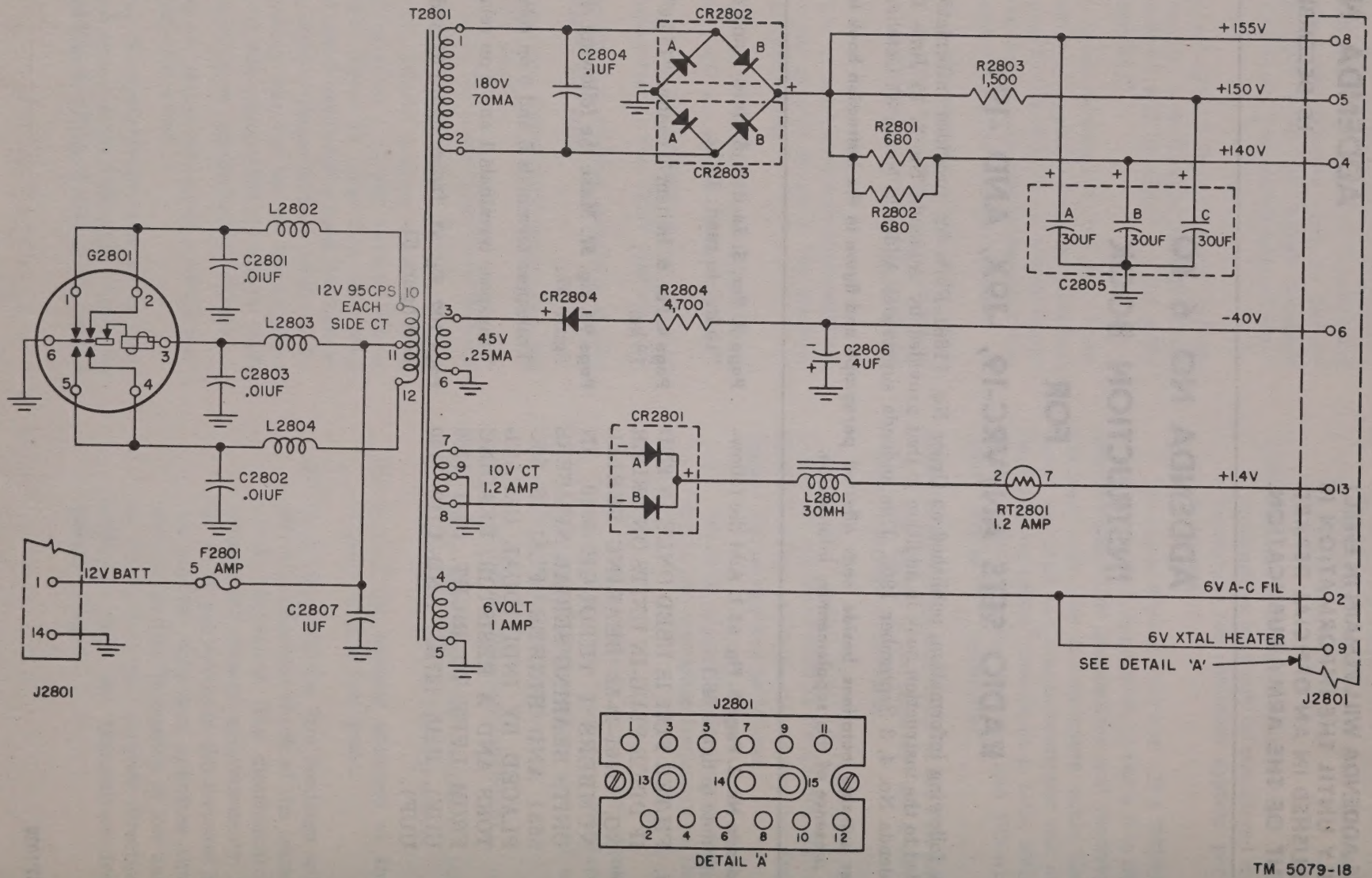


Figure 61. Power Supply PP–868/U, schematic diagram (12-volt).

THIS ADDENDA WILL REMAIN IN EFFECT UNTIL THE INFORMATION IS PUBLISHED IN AN OFFICIAL DEPARTMENT OF THE ARMY PUBLICATION.

ADDENDA
3 September 1953

ADDENDA NO. 4 TO INSTRUCTION BOOK FOR RADIO SETS AN/VRC-19, -19X, and -19Y

The following information, published on Order No. 11661–Phila–52, is to be added to Addenda No. 3 and to the instruction book as indicated.

Personnel using this equipment and having custody of this addenda will enter suitable notations beside each affected paragraph and figure in the instruction book to indicate the presence of this supplementary information.

INFORMATION TO BE ADDED TO ADDENDA NO. 3

Addenda No. 3. Page 1. Change item 6 to read as follows:

Page 12. Par. 20. Lines 3 and 4.

Change "Microphone impedance is 40 ohms; receiver impedance is 150 ohms" to read: Microphone resistance is 40 ohms; receiver impedance is 300 ohms.

Addenda No. 3. Page 2. Line 3. Change "Par. 42*a*(6)" to read: Par. 44*a*(6).

Addenda No. 3. Page 2. Item 8. (Page 63. Fig. 45).

Change "Reverse terminals 11 and 12 on terminal board TB1502" to read:

On Radio Set Control C–847/U units with serial numbers 601 and higher, reverse terminals 11 and 12 on terminal board TB1502.

Addenda No. 3. Page 4. Item 1. (Page 99. Fig. 58).

Delete "On relay K3103 * * * to read: 4".

Addenda No. 3. Page 5. Fig. 63.1. On all Radio Receiver R–394/U units using AUDIO & SQUELCH plug-in units with serial numbers 1300 and higher, make the following changes:

Change the value of R142 from 470K to 330K.

Change the value of R131 from 1 MEG to 470K.

Change the value of R132 from 47K to 68K.

Change the value of R136 from 220K to 330K.

Change the value of R137 from 470K to 560K.

Change the value of R147 from 220K to 120K.

Change the value of R149 from 470K to 220K.

Change the value of C129 from 24 uuf to 47 uuf.

Delete resistor R150 and lead connecting to pin 2 of V125.

Connect pin 2 of V125 to pin 2 of V124.

INFORMATION TO BE ADDED TO INSTRUCTION BOOK

Change "CY–938/VRC" throughout the instruction book to read: CY–938/VRC or CY–938A/VRC.

Change the transmitter power output from 30 watts to 25 watts in the following places:

Page 1. Par. 3. Line 5.

Page 2. Par. 4*a*. Line 5.

Page 9. Par. 12. Line 4.

Page 4. Par. 6. Item 9. Change "100 to 5000 cps" to read: 300 to 3500 cps.

Page 4. Par. 6. Item 11. Change "6 watts" to read: .5 watt.

Page 4. Par. 7. Change the heading to read:

Technical Characteristics of Dynamotor-Power Supplies DY–100/U, DY–93/G, and DY–98/G.

Delete the first two lines (Dynamotor * * * Supplies) below the heading.

Page 4. Par. 7. Column 2. Item 7 under Power output. Change "6 volts dc 3 amp" to read: 6 volts dc .3 amp.

Page 4. Par. 7. Next to last item under Power output. Change "1.3 volts dc 2 amp" to read: 1.3 volts dc .2 amp.

Page 6. Par. 10. Items 2, 3, and 4. Change the dimensions of Power Supplies PP–869/U, PP–868/U, and PP–867/U to read: 5 inches high x 6¼ inches deep x 7 inches long.

Page 6. Par. 10 Change item 9 to read as follows:

Component	Radio Set AN/VRC–19Y	Radio Set AN/VRC–19X	Radio Set AN/VRC–19	Dimensions of components			
				Height (in.)	Depth (in.)	Length (in.)	Weight (lb.)
Electrical Equipment Cabinet CY–938/VRC (with hardware)	1	1	1	17 1/16	10 3/4	18 15/16	33
or							
Electrical Equipment Cabinet CY–938A/VRC (with hardware)	1	1	1	16 1/2	10 1/2	19 5/16	33

Pages 8 and 9. Par. 11. Add the subparagraph designation letter *a* in front of the information in paragraph 11.

Change the last sentence of this subparagraph to read: The cabinet is $18\frac{5}{16}$ inches long by $17\frac{7}{16}$ inches high by $10\frac{3}{4}$ inches deep.

Add the following after subparagraph *a*:

b. Electrical Equipment Cabinet CY–938A/-VRC is identical to Electrical Equipment Cabinet CY–938/VRC with the following exceptions:

(1) The latch fasteners are mounted on the case covers of CY–938A/VRC.

(2) The over-all dimensions of CY–938A/-VRC are $19\frac{5}{16}$ inches long by 16½ inches high by 10½ inches deep.

Page 20. Fig. 21. Delete "E801" from the antenna connection.

Page 21. Par. 27c(2). Change "AN/VRC–19" to read: AN/VRC–19Y.

Page 22. Par. 27e. Line 11. Change "7 and 9" to read: 8 and 9.

Page 28. Par. 36. In lines 2 and 13, change "SQUELCH-OFF" to read: SQUELCH.

Page 28. Par. 36d. In line 7, change "SQUELCH-OFF" to read: SQUELCH.

Page 29. Par. 42. Line 7. Change ".5 mc" to read: 1 mc.

Page 30. Par. 43a(4). Make the following changes:

Line 4. Change "500 kc" to read: 1 mc.

Line 12. Change "±.5" to read: ±1.

Line 13. Change "161.5 or 162.5" to read: 161 or 163.

Line 16. Change "161500" to read: 161000.

Line 16. Change "5046.875" to read: 5031.250.

Page 30. Par. 43a(5). Line 3. Change "HR401" to read: E401.

Page 43. Fig. 33. Change "HR401" to read: E401.

Page 48. Fig. 35. Transpose "RT1201" and "RT1202".

Page 57. Par. 63b. Line 14. Change "contractor" to read: contactor.

Page 57. Par. 63b. Next to last line. Change "R1201 and R1202" to read: RT1201 and RT1202.

Page 58. Fig. 40. Delete the lead that connects from the junction of CR1301 and RT1301 and RT1302 to a terminal on K1301. Add resistor R1313 from this terminal on K1301 to the junction of R1302 and G1301.

Page 59. Fig. 41. In the caption, change "PP–869/U" to read: PP–867/U.

Page 60. Fig. 43. In the caption, change "PP–867/U" to read: PP–869/U.

Page 61. Fig. 44. Make the following changes in figure 44:

On the lower left-hand corner of the illustration, delete connector (J804).

Change E801 to read: J804.

Delete the word "ANT." located above connector J804.

Delete both leads connecting to J804.

Connect a lead from the center of J804 to the center of P801.

On terminal 1 of J801 and terminal 15 of J802, change "6V AC" to read: 6V AC or DC.

Page 64. Fig. 46. On Radio Set Control C–847/U units with serial numbers 601 and higher, make the following changes:

Transpose terminals 11 and 12 on TB1502.

Delete the lead connecting from terminal 12 of TB805 to the new terminal 11 of TB1502.

Delete the lead connecting from terminal 11 of TB805 to the new terminal 12 of TB1502.

Connect terminal 11 of TB805 to the new terminal 11 of TB1502.

Connect terminal 12 of TB805 to the new terminal 12 of TB1502.

In note 2, change "TB80" to read: TB801.

Page 65. Par. 68b(4). Line 6 from bottom. Change "clockwise" to read: counterclockwise.

Page 66. Fig. 47. On Radio Set Control C–847/U units with serial numbers 1 through 600, transpose terminals 11 and 12 of TB1502 in all eight places where they appear.

Page 68. Fig. 49. Make the following changes in figure 49:

On the lower left-hand corner of the illustration, change "P3105" to read: P3103.

Change "R293" to read: R253.

In note 1, add "unless otherwise specified".

On AUDIO & SQUELCH plug-in subassemblies with serial numbers 1300 and higher, change the value of R142 from 470K to 330K.

Page 69. Par. 71b. Line 8. Change "figure 50" to read: figure 49.

Page 69. Par. 72b. Line 10. Change "L41" to read: L40.

Page 69. Par. 72c. Line 4. Change "figure 51" to read: figure 50.

Page 71. Fig. 50. Make the following changes in figure 50:

Change terminal "7" on TB801 to read: 8.

Delete "and 12-" in note 6.

Change "R210" to read: R1210.

Page 73. Fig. 51. Make the following changes in figure 51:

Change terminal "7" on TB801 to read: 8.

Change terminal "21" on P3103 and J802 to read: 20.

Change terminal "2" on J803 to read: 19.

Page 75. Fig. 52. Make the following changes in figure 52:

Change terminal "14 TB1501" to read: 14 TB1502.

Change terminal "7" on TB801 to read: 8.

Delete lead connecting from junction of CR1301 and RT1301 and RT1302 to terminal 5 of K1301.

Add resistor R1313 (40 ohms) from terminal 5 of K1301 to terminal 7 of K1301.

Transpose terminals 7 and 2 on RT1301 and RT1302. Reverse the positions of R1301 and L1301.

On Dynamotor-Power Supply DY–98/G units with serial numbers 1201 and higher, delete R1301.

Change $\boxed{\begin{matrix}+1.3V\\J1303\end{matrix}}$ (lower right portion of diagram) to read: $\boxed{\begin{matrix}+1.3V\\J1301\end{matrix}}$

Page 80. Par. 77. Line 11 of the chart. Change "Fig. 46" to read: Fig. 44.

Page 80. Par. 77. Line 12 of the chart. Change "Fig. 47" to read: Fig. 45.

Page 81. Par. 80. Item 2. "Probable trouble" column. Change "clockwise" to read: counterclockwise.

Page 90. Par. 86. Line 6. Delete "(E801)".

Page 91. Par. 89. Line 2. Change "88" to read: 90.

Page 100. Fig. 59. Make the following changes in figure 59:

Delete the lead connecting from junction of CR1301 and RT1301 and RT1302 to terminal 5 of K3101. Add and connect resistor R1313 (40 ohms) from terminal 5 to terminal 7 of K1301.

On all Dynamotor-Power Supply DY–98/G units with serial numbers 1201 and higher, delete resistor R1301.

On lead connecting to terminal 6 of P1303, make the following changes:

Change "J1302" to read: J1306.

Change "P1302" to read: P1306.

Change "J1304" to read: J1302.

On lead connecting to terminal 4 of P1303, make the following changes:

Change "J1301" to read: J1305.

Change "P1301" to read: P1305.

Change "J1306" to read: J1304.

On lead connecting to terminal 3 of P1303, change "J1305" to read: J1303.

On lead connecting to terminal 16 of P1303, change "J1303" to read: J1301.

On the front panel test points detail at the bottom of the page, make the following changes:

Change "J1303" to read: J1301.

Change "J1304" to read: J1302.

Change "J1305" to read: J1303.

Change "J1306" to read: J1304.

Page 107. Fig. 64. Change the value of C436 from "25" uuf to "4–23" uuf.

Page 109. Fig. 65. Delete "E801".

Page 113. App. II. Par. 1. Make the following changes:

Item 1, lines 6 and 7, in the "Name of part and description" column, change "13 3/16" lg x 6 7/8" wd x 6 1/4" h o/a" to read: 14 1/2" lg x 7" wd x 8 5/8" h o/a.

Item 2, lines 7 and 8, in the "Name of part and description" column, change "13 3/16" lg x 6 7/8" wd x 6 1/4" h o/a" to read: 14 1/2" lg x 7" wd x 8 5/8" h o/a.

Item 3, line 2, in the "Name of part and description" column, change "380 v, 180 amp" to read: 380 v, .180 amp.

Item 3, line 8, in the "Name of part and description" column, change "13 1/16" lg x 6 7/8" wd x 6 1/4" h o/a" to read: 14 1/2" lg x 7" wd x 8 5/8" h o/a.

Add the following item after the last item on page:

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
	AN POWER SUPPLY PP–868/U: vibrator type; synchronous; output data, dc; 155 v, .015 amp; 150 v, .005 amp; 140 v, .060 amp; 1.4 v, 1.25 amp, regulated; –40 v, .0005 amp; ac; 6 v, .45 amp; input data, 12 v dc, 2 amp; 7" lg x 6 1/4" wd x 5" h o/a; filter incl; four 8–32 tapped mtg holes on 4 1/4" x 5 9/16" mtg/c; tropicalized; Motorola Inc. part #201V1195.	12-volt d-c power supply for receiver.	3H4497–868

Page 114. App. II. Par. 1. Item 4. Line 2. Change "30 v" to read: 25 w.

Page 115. App. II. Par. 2. Make the following changes:

In the paragraph heading, change "cabinet CY–1938/VRC" to read: Cabinets CY–938/-VRC and CY–938A/VRC. Make the same change at the top of pages 116 and 118.

Insert the following information after the first item:

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
	or CABINET, ELECTRICAL EQUIPMENT CY–938A/VRC: aluminum; olive drab enamel finish; o/a dimen 19 5/16" lg x 10 1/2" wd x 16 1/2" h; 3 sets of mtg rails; 3 female connectors; 12 spring catches for holding waterproof covers; 5 holes on each end for attaching to mtg; Motorola, Inc. part #201V1880.		

Ref symbol H801, H802, H803. In the "Name of part and description" column, change "ethyl cellulose acetate" to read: black Saran plastic.

Delete reference symbols H802, H803.

Ref symbol H804, H805. Make the following changes:

In the "Ref symbol" column, change "H804, H805" to read: H804, H805, H818.

In the "Name of part and description" column, change "ethyl cellulose acetate" to read: black Saran plastic.

Delete reference symbols H806, H807, H808 and associated information.

Page 116. App. II. Par. 2. Ref symbol J801. In the "Name of part and description" column, change "209T1033" in the last line to read: 209T1008.

Page 116. App. II. Par. 2. Ref symbol J-803. In the "Name of part and description" column:

Change "53/64 in. d o/a" to read: 53/64 in. d o/a.

Change "No. DPD–31C1–33S type L" to read: No. DPD–B31C1–33S–2L.

Page 117. App. II. Par. 2. In the "Ref symbol" column, "O 805 thru O 816", add the following: (in CY–938/VRC).

Page 117. App. II. Par. 2. Insert the following information after the first item.

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
O 805 thru O 816 (in CY-938A/VRC only)	FASTENER, latch: SS; olive drab enamel finish; o/a dim 2 11/16" lg x 1 13/64" wd x 2" d; American Hardware Corp. catalogue #15828.	Cabinet latches for cabinet covers.	

Page 117. App. II. Par. 2. Ref symbol U803, U804. In the "Name of part and description" column:

Change "$\frac{3}{16}$ in. ID" to read: $\frac{5}{16}$ in. ID.

Change "No. 232B1005" to read: No. 232C-1103.

Delete Signal Corps stock No. 2Z4866.577.

Page 117. App. II. Par. 2. Ref symbol H809, H810, H811.

Delete all associated information.

Page 118. App. II. Par. 2. Make the following changes:

Ref symbol U801. In the "Name of part and description" column, change ".687 in. lg x 1.14 in. dia o/a" to read: .75 in. lg x 1.18 in. dia o/a.

Ref symbol U802. In the "Name of part and description" column, change ".687 in. lg x 1.452 in. dia o/a" to read: .75 in. lg x 1.392 in. dia o/a.

Change Ref symbol "TB801" to read: TB801, TB802, TB804, TB805.

Ref symbol W3551. In the "Name of part and description" column, line 6, change "48 strands" to read: 43 strands.

Pages 115 through 118. App. II. Par. 2. Add the following in correct alphabetical order.

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
E801	BUS-BAR: brass, rectangular; solid; o/a cross sect. dimen .437" wd x .064" h x 1.75" lg o/a; 2 mtg holes; Motorola, Inc. part #264B1100.	Shorting strip for terminal board TB806.	6F290–938
H832	CAP, electrical: brass; silver plated; $\frac{9}{16}$" lg x $\frac{9}{16}$" dia; American Phenolic Corp part #31–006.	Protective cap for antenna receptacle.	
H819	CLAMP, electrical: spring steel; o/a dimen 1.567" lg x .625" wd x 1.24" h; accom mat up to $\frac{7}{8}$" max dia; Tinnerman Products Inc. part #A3044SF–7–.3G; Motorola, Inc. part #242T1060.	Cable clamp.	
H820 thru H831	COLLAR, spacing: brass; shoulder shape; .159" lg x .375" dia o/a; Motorola, Inc. part #243B1070.	Spacing collar for mounting of receptacle.	
U805	GASKET: rubber; cylindrical grommet shape; $1\frac{5}{8}$" dia x $\frac{3}{4}$" lg o/a; Motorola, Inc. part #232B1113.	Waterproof seal for cable through panel.	

Pages 119 through 122. App. II. Par. 3. Add the following in correct alphabetical order.

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
A 1504	BRACKET: "L" shape; steel; o/a dimen 3" lg x $3\frac{3}{8}$" h x 1" d; Motorola, Inc. part #207B1435.	Holds handset clip.	
H1515	CLEANER, air: aluminum; 1" across flats x $\frac{3}{8}$" thk o/a; Motorola, Inc. part #201B1503.	Watertight breather.	
A 1503	COVER: o/a dimen $7\frac{1}{2}$" lg x $5\frac{3}{16}$" wd x $\frac{47}{64}$" thk; Motorola, Inc. part #215C1210.	Cover assembly.	
H1513	HOLDER, handset: Beryllium copper; o/a dimen $2\frac{1}{2}$" lg x $1\frac{1}{2}$" wd x $\frac{21}{32}$" h; Motorola, Inc. part #242B1176.	Holds handset when not in use.	
H1514	MOUNTING: flat bar shape; steel; o/a dimen $9\frac{3}{4}$" lg x $2\frac{11}{16}$" wd x $1\frac{11}{16}$" h; Motorola, Inc. part #207C1093.	Mounting bracket for radio set control.	
A 1502	PLATE, cover: zinc alloy; painted green on side; rectangular; o/a dimen $7\frac{1}{2}$" lg x $5\frac{3}{16}$" wd x $\frac{3}{16}$" thk; 8 threaded mtg holes; Motorola, Inc. part #215D1067.	Protective cover for radio set control.	

Page 119. App. II. Par. 2. Ref symbol E3551, E3552. In the "Name of part and description" column, line 3, change "1¼ in. lg x $\frac{11}{32}$ in. w x $\frac{5}{16}$ in. h o/a" to read: $1\frac{3}{32}$" lg x $\frac{13}{32}$" wd x $\frac{9}{32}$" h o/a.

In the last line, change "929R102" to read: 929R106.

Page 119. App. II. Par. 3. In the "Ref symbol column", change "H1505, H1512" to read: H1505 thru H1512.

In the "Name of part and description" column, line 4, change ".437 in." to read: .562 in.

Page 119. App. II. Par. 3. Ref symbol U1501. In the "Name of part and description" column, line 3, change ".687 in. lg" to read: .75" lg.

Page 120. App. II. Par. 3. Ref symbol I 1501, I 1502. in the "Name of part and description" column, line 1, change "1–2 watts" to read: 1.2 watts.

Page 120. App. II. Par. 3. Ref symbol I 1505. In the "Name of part and description" column, last line, change "361T1101" to read: 261T1101.

Page 123. INDEX. Make the following changes under letter A:

On "Altitude limit", change paragraph "7" to read: 7 and 8. Change page "4" to read: 4 and 5.

On "Assembly of components", change page "20" to read: 18.

Page 123. INDEX. Make the following changes under letter B:

On "Battery cables connection", change page "23" to read: 21.

On "Battery cables description", change page "13" to read: 12.

On "Battery polarity", change page "23" to read: 22.

Page 123. INDEX. Make the following changes under letter D:

Under Data, change "voltage and resistance" to read: resistance.

Change "DY–93/U" to read: DY–93/G.

Change "PP–639/U" to read: DY–98/G.

Change "PP–640/U" to read: DY–100/U.

Page 124. INDEX. Make the following changes to the index:

Under letter F, change page "41" to read: 37.

Under letter H, change page "13" to read: 12.

Under letter I, change page "20" to read: 18.

Under letter O, change page "41" to read: 37.

THESE ADDENDA WILL REMAIN IN EFFECT UNTIL THE INFORMATION IS PUBLISHED IN AN OFFICIAL DEPARTMENT OF THE ARMY PUBLICATION.

ADDENDA
15 JUNE 1953

ADDENDA NO. 3 TO INSTRUCTION BOOK FOR RADIO SETS AN/VRC -19, -19X, -19Y

The following information, published on Order No. 11661-Phila-52, provides information in addition to that found in the instruction book. These addenda supersede Addenda No. 1, 30 March 1953 and Addenda No. 2, 15 May 1953.

Personnel using this equipment and having custody of these addenda will enter suitable notations beside each affected paragraph and figure in the instruction book to indicate the presence of this supplementary information.

Change "Dynamotor DY-93/U" to read: Dynamotor - Power Supply DY-93/G, wherever it appears in the instruction book.

Change "Dynamotor DY-98/U" to read: Dynamotor - Power Supply DY-98/G, wherever it appears in the instruction book.

Page 9. Par. 12. Line 3. Change "12" to read: 13.

Page 9. Fig. 7. Change "TM 5092-527" to read: TM 297-201.

Page 11. Par. 15c. Change subparagraph c to read: The use of dynamotors limits the continuous operation time of the transmitter. Keep periods of transmission as short as possible to prevent dynamotor overheating.

Page 12. Par. 20. Line 4. Change "impedance is 150 ohms" to read: resistance is 300 ohms.

Page 20. Fig. 21. Reverse the numbering of connection 1 and 2 on terminal board TB806.

Page 21. Par. 26g. Lines 10 thru 16. Change sentences 5, 6, and 7 to read: Each of the components (receiver, transmitter and transmitter power supply) is held in place by a cam head fastener. The cam-head is at the back of the component and has an extension to a handle on the front panel. The component is released by turning the handle counterclockwise.

Page 21. Par. 26g. Line 2 from bottom of subparagraph g. Change "holding nut" to read: handle.

Page 23. Par. 30. Control column. Item SQUELCH-OFF. Change "SQUELCH-OFF" to read: SQUELCH-ON-OFF.

Page 23. Fig. 22. Add the panel marking ON to the left position of the SQUELCH control.

Page 31. Make the following changes.

Par. 43b. Change Caution to read: Keep periods of transmitter operation as short as possible to prevent overheating of the transmitter power supply dynamotor.

Par. 43b(3). Line 11. Change "two-thirds" to read: nine tenths.

Par. 43b(3). Line 13. Change "-3.5" to read: -5.

Par. 43b(6). Line 4. Change "-75" to read: -70.

Par. 43b(9). Add the following after CAUTION:

Caution: When using a voltmeter with a metal case across the PL CUR jacks make sure that you do not touch the case of the meter. There is a high potential at this point.

Page 34. Make the following changes.

Par. 44a(2). Change subparagraph (2) to read: Remove the top cover and the plug-in assembly marked LOCAL OSC 152-174 MC.

Par. 44a(3). Line 1. Change ''shields'' to read: shield.

Par. 42a(6). Line 2. Change "figure 28" to read: figures 7 and 28.

Page 37. Par. 45. Line 9. Change "30 inches" to read: 48 inches.

Page 42. Fig. 32. Delete locking studs from illustration.

Page 43. Fig. 33. Delete the following: "5TH DBLR AND DRIVER 2E26 IN RADIO XMTR T-416/GR" and "PWR AMPL 5894A IN RADIO XMTR T-416/GR".

Page 44. Fig. 34. AUDIO AND SQUELCH PLUG-IN-UNIT. Change "AUDIO OUTPUT V122 6AK6" to read: AUDIO POWER AMPL V122 6AK6.

In illustration of LOCAL OSC 152-174 MC PLUG-IN-UNIT change "VR31" to read: V34.

In illustration of 1ST I.F. 7.8 MC PLUG-IN-UNIT, reverse "7.8 MC I-F AMPL V51 5678" and 2D MIXER V52 5678".

Page 53. Fig. 38. Change "AUDIO OUTPUT V122 6AK6" to read: AUDIO POWER AMPL V122 6AK6.

Page 55. Par. 62e. Line 13. Change "VR31" to read: V34.

Page 61. Fig. 44. Make the following changes:

Add a jumper between terminals 3 and 4 of TB801.

Add a jumper between terminals 5 and 6 and another between terminals 8 and 9 of TB802.

Change "Filament 6V" at terminal 7 of TB804 to read: Filament 1.25V.

Reverse terminals 28 and 29 of jack J803.

Page 63. Fig. 45. Make the following changes: Change the value of resistor R1504 from "15" to 10 ohms.

Reverse terminals 11 and 12 on terminal board TB 1502.

Change "6V" at terminal 7 of TB1501 to read: 1.25 V DC.

On equipment with serial numbers beginning with 496, add a terminal number 3 to terminal board TB1501 and connect it to pin K of jack J1501.

On equipment with serial numbers beginning with 601; add a jumper between pins E and H of jack J1501, delete the lead between terminal 19 of TB1502 and pin D of jack J1501, and reverse the numbers on pins "19" and "20" of TB1502.

Page 64. Fig. 46. Change "AUDIO OUTPUT V122 6AK6" to read: AUDIO POWER AMPL V122 6AK6.

Page 65. Make the following changes:

Add the following to the end of paragraph 68b(3). On equipment beginning with serial number 601, the output of the handset microphone is taken from the control unit through terminal C of J1501 and terminal 19 of TB1502.

Par. 68b(4). Line 8. Change "6-volt" to read: 1.25-volts.

Line 16. Change "6-volts" to read: 1.25 volts.

Line 29. Change "less" to read: more.

Par. 69b. Seventh line from bottom of page. Change "(15 ohms)" to read: (10 ohms).

Page 66. Fig. 47. Make the following changes.

In illustration C change the value of resistor R1504 from "15" to 10 ohms.

In equivalent circuit of illustration C change "15" to read: 10.

Page 67. Fig. 48. Add figure 48.1 after figure 48.

Page 67. Par. 70a. Line 3. Change "(terminals 1 and 3)" to read: (terminals 1 and 2).

Page 68. Fig. 49. Change "POWER AMPL V122 6AK6" to read: AUDIO POWER AMPL V122 6AK6.

Page 71. Fig. 50. Make the following changes.

Change "HR 401 XMTR OVEN" to read: E401 XMTR OVEN.

Change "L P271" to read: P P271.

Change "L J263" to read: P J263.

Change "29 P252" to read: 28 P252.

Change "29 J803" to read: 28 J803.

Change R410 from "10" to 15 ohms.

Page 73. Fig. 51. Make the following changes. Add "SEE NOTE 7" to JUMPER between terminals 3 and 4 of TB802.

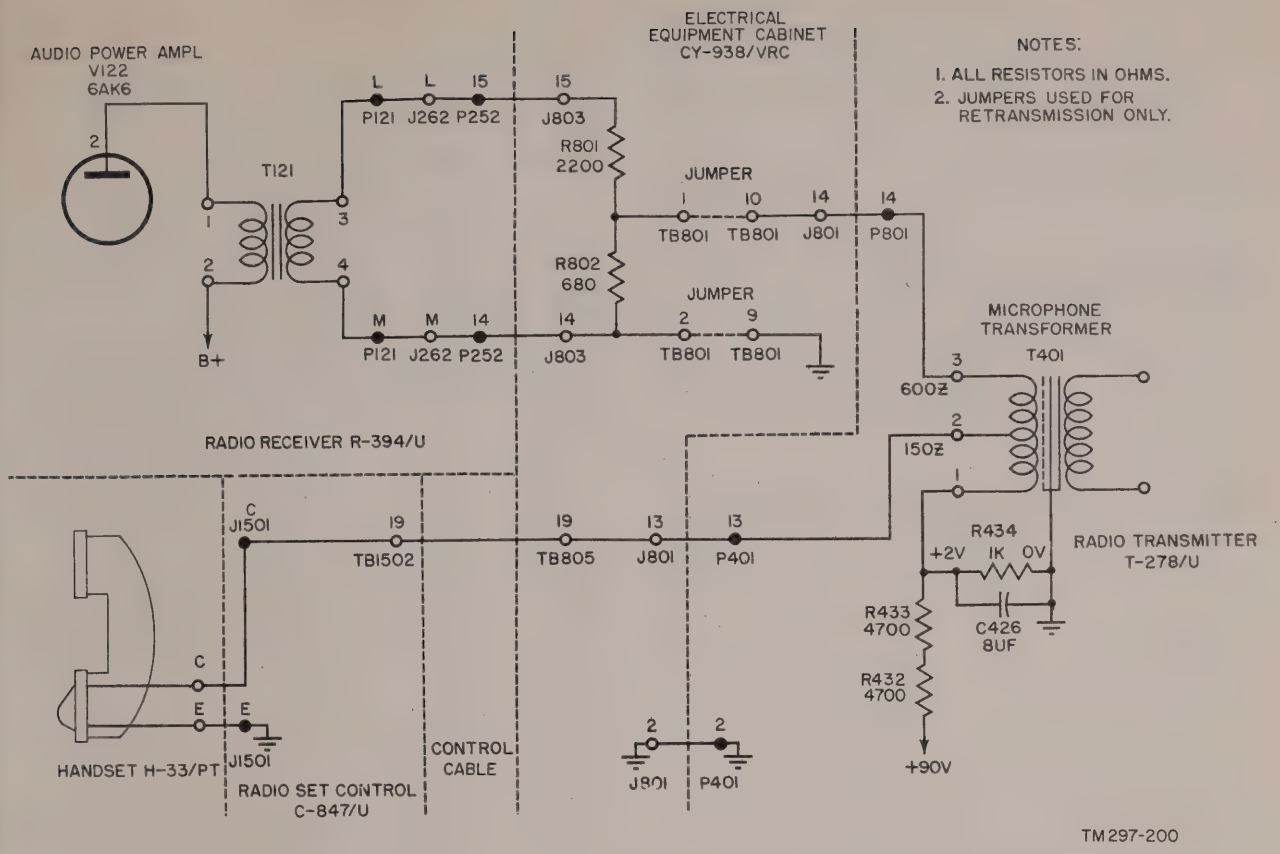


Figure 48.1. Microphone and retransmission audio circuits (on equipment beginning with serial number 601).

Add the following after NOTE 6: 7. Connect jumper for 12-volt operation.

Change "2 P252" to read: 19 P252.

Change "15 P251" to read: 1 P251.

Change "HR 401 XMTR OVEN" to read: E401 XMTR OVEN.

Change "L P271" to read: P P271.

Change "L J263" to read: P J263.

Change "29 P252" to read: 28 P252.

Change "29 J803" to read: 28 J803.

Change R410 from "10" to 15.

Page 75. Fig. 52. Make the following changes. Change "HR401 XMTR OVEN" to read: E401 XMTR OVEN.

Change "L P271" to read: P P271.

Change "L J263" to read: P J263.

Change "29 P252" to read: 28 P252.

Change "29 J803" to read: 28 J803.

Change R410 from "10" to 15.

Page 77. Par. 74b. Line 1. Change "HR401" to read: E401.

Page 89. Fig. 53. Bottom of illustration.

The physical location of J1501 and the cable entrance hole should be reversed.

Page 89. Fig. 54. Make the following changes. Insert a wire to terminals 3 and 4 of TB802 from the same cable that supplies the other terminals.

Add a jumper between terminal 5 and 6 of TB802.

Add a jumper between terminals 8 and 9 of TB802.

Add a jumper between terminals 3 and 4 of TB801.

Page 98. Fig. 57. On relay K1203, change terminal "4" to read: 6 and "6" to read: 4.

On resistance RT1201 and RT1202, change terminal "2" to read: 7 and "7" to read: 2.

Add the symbol 2 as a chassis marking next to P1201.

Add the symbol 1 as a chassis marking next to P1202.

Page 99. Fig. 58. On relay K3103, change terminal "4" to read: 6 and "6" to read: 4.

Add the symbol 2 as a chassis marking next to P3101.

Add the symbol 1 as a chassis marking next to P3102.

Page 100. Fig. 59. On resistance RT1301 and RT1302, change terminal "2" to read: 7 and "7" to read: 2.

Add the symbol 2 as a chassis marking next to P1301.

Add the symbol 1 as a chassis marking next to P1302.

Reverse the positions of R1301 and L1301.

Page 103. Fig. 62. Add a capacitor, C2908, .01 UF, between chassis ground and terminal 3 of G2901.

Add an inductance, L2903 6.5 UH, between terminal 3 of F2901 and terminal 11 of T2901.

Add an inductance, L2904 6.5 UH, between terminal 4 of G2901 and capacitor C2903.

Add an inductance, L2902 6.5 UH, between terminal 2 of G2901 and capacitor C2901.

Page 105. Fig. 63. Insert figure 63.1 after figure 63.

Page 107. Fig. 64. Make the following changes in figure 64. Change "HR401" to read: E401.

Delete capacitors C464 and C465.

Change R410 from "10" to 15.

Change C463 from "500" to 510.

Reverse reference symbols "R458" and "R474", but leave the values as they are."

Change C456 from "250" to 240.

Change C429, C437, and C439 from "25" to 4-23.

Delete "R473, 4700" and replace it with coil L411 1.5UH.

On equipment bearing serial numbers beginning with 496, change R414 "680K" to read: 560K.

On equipment bearing serial numbers beginning with 601, delete the lead between pin 15 of P401 and the junction of C426 and R434, delete the ground symbol at terminal 1 of T401, and connect a lead between terminal 1 of T401 and the junction of C426 and R434.

Page 109. Fig. 65. Make the following changes on figure 65. Connect a jumper between terminals 5 and 6 and another between terminals 8 and 9 of TB802.

Connect a jumper between terminals 3 and 4 of TB801.

Delete the RED 1 lead from terminal 1 of J802 and also the RED 1 lead from F801. Make a direct cable connection between these two points.

Page 111. Fig. 66. Make the following changes on figure 66.

Note 5. Delete the word "and".

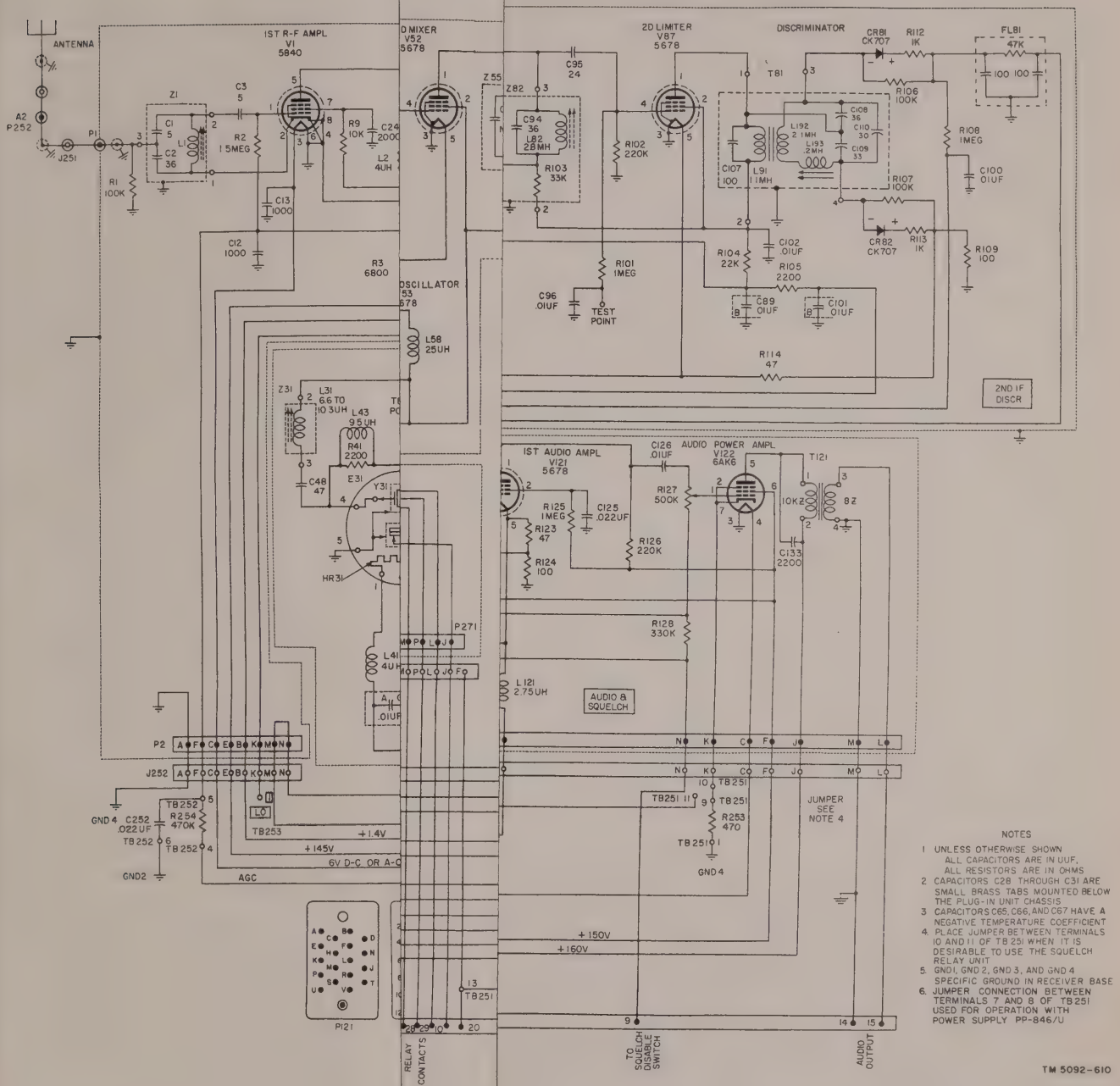
Connect a jumper between terminals 3 and 4 of TB801.

Connect a jumper between terminals 5 and 6 and another between terminals 8 and 9 of TB802.

Page 121. App. II. Par.2. Make the following change.

Item R1502, R1503. Ref. symbol column.

Change R1502, R1503 to read: R1502, R1503, R1504.



NOTES

1. UNLESS OTHERWISE SHOWN ALL CAPACITORS ARE IN UUF, ALL RESISTORS ARE IN OHMS
2. CAPACITORS C28 THROUGH C31 ARE SMALL BRASS TABS MOUNTED BELOW THE PLUG-IN UNIT CHASSIS
3. CAPACITORS C65, C66, AND C67 HAVE A NEGATIVE TEMPERATURE COEFFICIENT
4. PLACE JUMPER BETWEEN TERMINALS 10 AND 11 OF TB 251 WHEN IT IS DESIRABLE TO USE THE SQUELCH RELAY UNIT
5. GND1, GND 2, GND 3, AND GND 4 SPECIFIC GROUND IN RECEIVER BASE
6. JUMPER CONNECTION BETWEEN TERMINALS 7 AND 8 OF TB 251 USED FOR OPERATION WITH POWER SUPPLY PP-846/U

TM 5092-610

On resistance RT1201 and RT1202, change terminal "2" to read: 7 and "7" to read: 2.

Add the symbol 2 as a chassis marking next to P1201.

Add the symbol 1 as a chassis marking next to P1202.

Page 99. Fig. 58. On relay K3103, change terminal "4" to read: 6 and "6" to read: 4.

Add the symbol 2 as a chassis marking next to P3101.

Add the symbol 1 as a chassis marking next to P3102.

Page 100. Fig. 59. On resistance RT1301 and RT1302, change terminal "2" to read: 7 and "7" to read: 2.

Add the symbol 2 as a chassis marking next to P1301.

Add the symbol 1 as a chassis marking next to P1302.

Reverse the positions of R1301 and L1301.

Page 103. Fig. 62. Add a capacitor, C2908, .01 UF, between chassis ground and terminal 3 of G2901.

Add an inductance, L2903 6.5 UH, between terminal 3 of F2901 and terminal 11 of T2901.

Add an inductance, L2904 6.5 UH, between terminal 4 of G2901 and capacitor C2903.

Add an inductance, L2902 6.5 UH, between terminal 2 of G2901 and capacitor C2901.

Page 105. Fig. 63. Insert figure 63.1 after figure 63.

Page 107. Fig. 64. Make the following changes in figure 64. Change "HR401" to read: E401.

Delete capacitors C464 and C465.

Change R410 from "10" to 15.

Change C463 from "500" to 510.

Reverse reference symbols "R458" and "R474", but leave the values as they are."

Change C456 from "250" to 240.

Change C429, C437, and C439 from "25" to 4-23.

Delete "R473, 4700" and replace it with coil L411 1.5UH.

On equipment bearing serial numbers beginning with 496, change R414 "680K" to read: 560K.

On equipment bearing serial numbers beginning with 601, delete the lead between pin 15 of P401 and the junction of C426 and R434, delete the ground symbol at terminal 1 of T401, and connect a lead between terminal 1 of T401 and the junction of C426 and R434.

Page 109. Fig. 65. Make the following changes on figure 65. Connect a jumper between terminals 5 and 6 and another between terminals 8 and 9 of TB802.

Connect a jumper between terminals 3 and 4 of TB801.

Delete the RED 1 lead from terminal 1 of J802 and also the RED 1 lead from F801. Make a direct cable connection between these two points.

Page 111. Fig. 66. Make the following changes on figure 66.

Note 5. Delete the word "and".

Connect a jumper between terminals 3 and 4 of TB801.

Connect a jumper between terminals 5 and 6 and another between terminals 8 and 9 of TB802.

Page 121. App. II. Par.2. Make the following change.

Item R1502, R1503. Ref. symbol column.

Change R1502, R1503 to read: R1502, R1503, R1504.

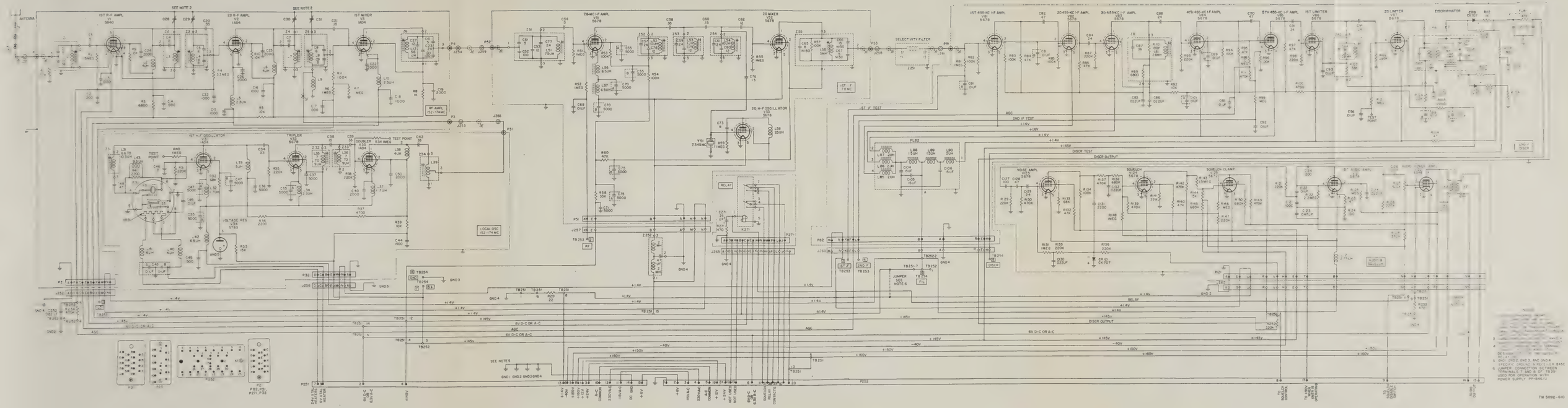
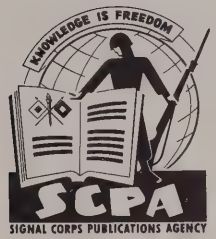


Figure 63.1. Radio Receiver R-394/U, schematic diagram.

INSTRUCTION BOOK

FOR

RADIO SETS AN/VRC-19, -19X, and -19Y



Manufactured by
MOTOROLA, INC.
Order No. 11661-Phila-52
21 March 1953

WARNING

HIGH VOLTAGE

is used in the operation
of this equipment.

DEATH ON CONTACT

may result if personnel fail to
observe safety precautions.

Be careful not to contact high-voltage connections or input connections when working on or near this equipment. When working inside the equipment, after the power has been turned off, always short-circuit the high-voltage capacitors.

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ARTIFICIAL RESPIRATION

GENERAL PRINCIPLES

1. Seconds count! Begin at once! Don't take time to move the victim unless you must. Don't loosen clothes, apply stimulants or try to warm the victim. Start resuscitation! Get air in the lungs! You may save a life!

2. Place the victim's body in a prone position, so that any fluids will drain from the respiratory passages. The head should be extended and turned sideward *never flexed forward;* the chin shouldn't sag, since obstruction of the respiratory passages may occur.

3. Remove any froth or debris from the mouth with your fingers. Draw the victim's tongue forward.

4. Begin artificial respiration. Continue it rhythmically and without any interruption until natural breathing starts or the victim is pronounced dead. Try to keep the rhythm smooth. Split-second timing is not absolutely essential.

5. When the victim starts breathing, or when additional help is available loosen the clothing; remove it, if it's wet; keep the victim warm. Shock should receive adequate attention. Don't interrupt the rhythmical artificial technique for these measures. Do them only when you have help or when natural breathing has started.

6. When the victim is breathing, adjust your timing to assist him. Don't fight his efforts to breathe. Synchronize your efforts with his. After resuscitation, keep him lying down until seen by a physician or until recovery seems certain.

7. Don't wait for mechanical resuscitation! If an approved model is available, use it, but, since mechanical resuscitators are only slightly more effective than properly performed "push-pull" manual technique, *never* delay manual resuscitation for it.

BACK-PRESSURE ARM LIFT METHOD

1. *Position of Victim.* Place the victim in the prone (face-down) position. Bend his elbows; place one hand upon the other. Turn his face to one side, placing his cheek upon his hands.

2. *Position of Operator.* Kneel on your left or right knee, at the victim's head, facing him. Your knee should be at the side of the victim's head close to his forearm, your foot should be near his elbow. Kneel on both knees if you find it more comfortable, with one knee on each side of the head. Place your hands on the flat of the victim's back so that their heels are just below the lower tip of his shoulder blades. With the tip of your thumbs touching spread your fingers downward and outward. (See A)

3. *Compression Phase.* Rock forward until your arms are approximately vertical and allow the weight of the upper part of your body to exert a slow, steady, even, downward pressure upon your hands. This forces air out of the lungs. Keep your elbows straight and press almost directly downward on the back. (See B)

4. *Expansion Phase.* Release the pressure, avoid any finish thrust, and commence to rock backward slowly. Place your arms upon the victim's arms just above the elbows, and draw his arms upward and toward you. Apply just enough lift to feel resistance and tension at the victim's shoulders.

Don't bend your elbows. As you rock backward, the victim's arms will be drawn toward you. (The arm lift expands the chest by pulling on the chest muscles, arching the back and relieving the weight on the chest.) Drop the arms gently to the ground or floor. This completes the cycle. (See C and D). Now, repeat the cycle.

5. *Cycle Timing and Rhythm.* Repeat the cycle 10 to 12 times per minute. Use a steady uniform rate of Press, Release, Lift, Release. Longer counts of about equal length should be given to the "Press" and "Lift" steps of the compression and expansion phases. Make the "Release" periods of minimum duration.

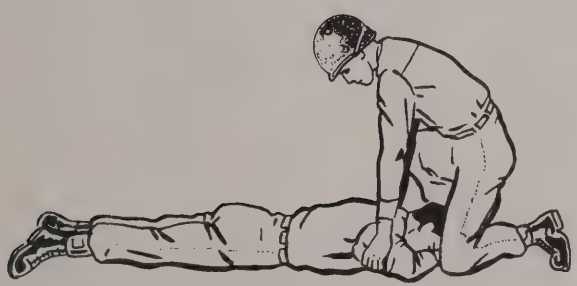
6. *Changing Position or Operator.*

(*a*) Remember that you can use either or both knees or can shift knees during the procedure, provided you don't break the rhythm. Observe how you rock forward with the back-pressure and backward with the arm-lift. The rocking motion helps to sustain the rhythm and adds to the ease of operation.

(*b*) If you tire and another person is available, you can "take turns." Be careful not to break the rhythm in changing. Move to one side and let your replacement come in from the other side. Your replacement begins the "Press-Release" after one of the "Lift-Release" phases, as you move away.

A Position of operator and victim

B Compression phase



C Expansion phase (arm lift)

D Expansion phase (arm release)

TM AR-4

Figure 1. Radio Set AN/VRC-19 (*) shown installed in a jeep.

Note. This instruction book will be replaced by TM 11-297 which, when published will be listed in SR 310-20-4.

CHAPTER 1
INTRODUCTION

Section I. GENERAL

1. Scope

a. This instruction book contains instructions for the installation, operation, maintenance, and repair of Radio Set AN/VRC-19(*) (fig. 1). In addition to this information there are two appendixes covering a list of references, and an identification table of parts.

b. Radio Set AN/VRC-19 followed by (*) indicates the three models of equipment covered in this instruction book. The three separate models are designated by unlettered, X, and Y. The unlettered, X, and Y models are used in vehicles having 24-, 12-, and 6-volt batteries respectively.

2. Forms and Records

The following forms will be used for reporting unsatisfactory conditions of Army material and equipment.

a. DD Form 6, Report of Damaged or Improper Shipment, will be filled out and forwarded as prescribed in SR 745-45-5 (Army), NAV DEPT SERIAL 85P00 (Navy), and AFR 71-4 (Air Force).

b. DA AGO Form 468, Unsatisfactory Equipment Report, will be filled out and forwarded to the Office of the Chief Signal Officer as prescribed in SR 700-45-5.

c. USAF Form 54, Unsatisfactory Report, will be filled out and forwarded to Commanding General, Air Materiel Command, Wright-Patterson Air Force Base, Dayton, Ohio, as prescribed in SR 700-45-5 and AFR 65-26.

d. DA AGO Form 11-238, Operator First Echelon Maintenance Check List for Signal Corps Equipment (Radio Communication, Direction Finding, Carrier, Radar), will be prepared in accordance with instructions on the back of the form (fig. 30).

e. DA AGO Form 11-239, Second and Third Echelon Maintenance Check List for Signal Corps Equipment (Radio Communication, Direction Finding, Carrier, Radar), will be prepared in accordance with instructions on the back of the form (fig. 31).

f. Use other forms and records as authorized.

Section II. DESCRIPTION AND DATA

3. Purpose and Use

Radio Set AN/VRC-19(*) is a mobile f-m (frequency modulated) set normally used for nontactical purposes. It operates in the vhf (very high frequency) range of 152 to 174 mc (megacycles). The power output is approximately 30 watts and is sufficient to allow consistent network operation with station spacings of approximately 25 miles line of sight under most conditions.

a. The radio set can be installed in several different types of vehicles such as railroad trains, jeeps, sedans, trucks, and ambulances. The cabinet which houses the radio set can be mounted in various positions to facilitate installation.

b. Flexibility is provided by the use of plug-in power supplies; it is only necessary to use the correct power supplies for the receiver and transmitter and make a few interconnections when changing the radio set from one source voltage to another.

c. Control of the radio set is maintained either at the radio set proper or elsewhere in the vehicle. This is permitted by the use of a remote control unit which has all the facilities necessary for push-to-talk operation. Operation is simplified to the extent that a qualified radio operator is not necessary. The driver in most cases, should be able to operate the radio set.

d. The radio set consists of an Electrical Equipment Cabinet CY-938/VRC, Radio Receiver R-394/U, a receiver power supply, Radio Transmitter T-278/U, a transmitter power supply, Radio

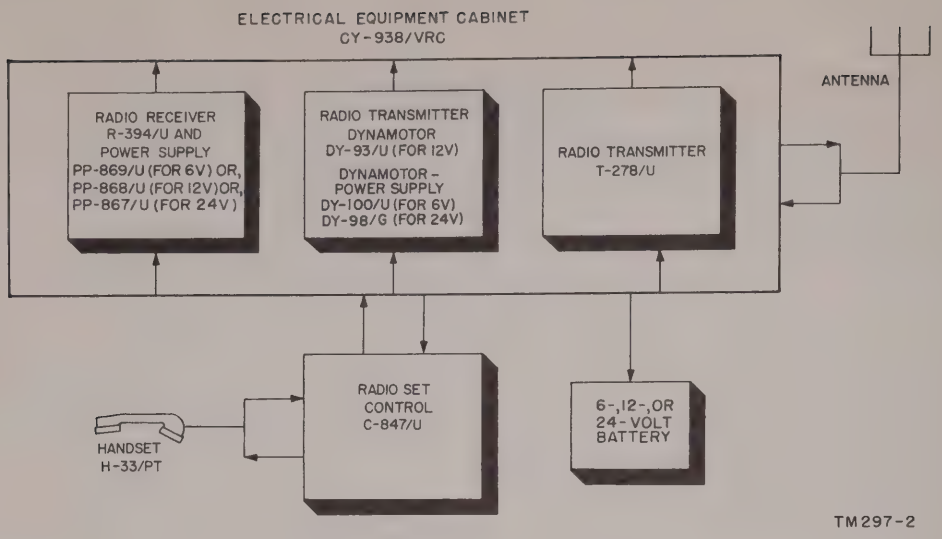


Figure 2. Radio Set AN/VRC-19(*), block diagram.

Set Control C-847/U, a control cable, a battery cable, an antenna, a coaxial antenna cable, a cabinet rack, and a control unit mount (used only in some installations). The electrical components of the radio set are shown in block diagram form in figure 2.

4. System Application

Radio Set AN/VRC-19(*) is a small mobile receiving and transmitting station. It is one radio set in a group which is collectively called the non-tactical series. This group is divided into two frequency ranges, the low band covering 25 to 50 mc and the high band covering 152 to 174 mc. Radio Set AN/VRC-19(*) operates in the high band. Normally this frequency range is occupied by transmitters and receivers operated by civilian police, taxi, fire, transportation, and other utilities. It is possible that the radio set could be operated in conjunction with these civilian facilities if necessary. A block diagram showing a typical network of high-band radio sets is illustrated in figure 3. This is purely a theoretical setup to show how communications could be carried on by the equipments; however, many other combinations of equipments are possible.

a. Radio Set AN/VRC-19(*), being mobile, has certain limitations; siting may not always be favorable, and it is operated by battery power. The battery operation limits its transmitter output to approximately 30 watts. The antenna is always installed near the ground in comparison to that of a fixed station and therefore, is more affected by obstructions such as trees, hills, buildings, etc.

b. Simplex conversation (both directions, one at a time) can be carried on with any of the radio sets in the high band group with the exception of Radio Receiving Set AN/FRR-36.

c. The equipments with which Radio Set AN/VRC-19(*) can maintain communication are as follows:

(1) Radio Set AN/TRC-28.
(2) Radio Set AN/FRC-27.
(3) Other Radio Sets AN/VRC-19(*).
(4) Radio Receiving Set AN/FRR-36. (Only one-way communication to Radio Receiving Set AN/FRR-36 is possible.)

5. Technical Characteristics of Radio Transmitter T-278/U

Frequency range	152 to 174 mc.
Transmitter type	Crystal-controlled f-m.
Distance range	Line of sight.
Type of modulation . . .	F-m, as derived from phase modulation.
Frequency deviation . .	15 kc (kilocycle) deviation for 100% modulation at 1000 cycles. Deviation limited to 15 kc for all frequencies.
Type of transmission .	Voice.
Crystals:	
Type	JAN CR-27/U, calibrated for 32 uuf (micromicrofarad) circuit.
Frequency range . . .	4750 to 5437.5 kc.
Frequency multiplication in transmitter	32 times on all frequencies.
Output impedance	50 ohms into coaxial cable.
Audio input:	
Carbon microphone .	100 mv (millivolt) for

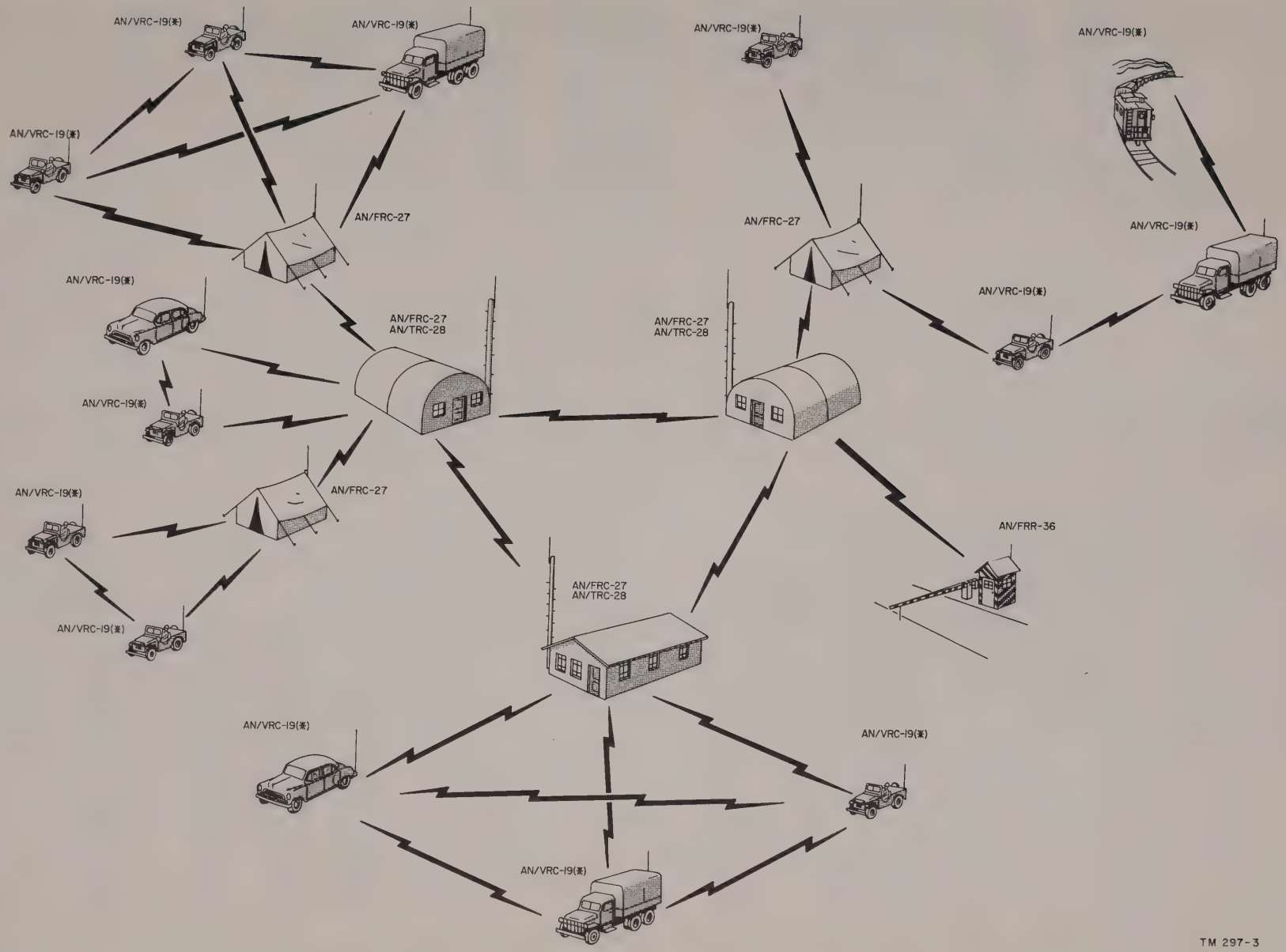


Figure 3. Non-tactical series typical system application.

	100% modulation at 1000 cycles.
600-ohm line input . .	200 mv for 100% modulation at 1000 cycles.
Spurious emission . . .	Attenuated at least 70 db (decibels) below carrier.
Antenna	1/4 wavelength vertical.
Number of tubes	13.
Power supply	External d-c (direct-current) operated Dynamotor-Power supply DY-100/U, Dynamotor DY-93/U, or Dynamotor-Power Supply DY-98/G

6. Technical Characteristics of Radio Receiver R-394/U

Frequency range	152 to 174 mc.
Receiver Type	Dual conversion, crystal controlled, superheterodyne, fixed frequency.
Crystal frequency range	24.033 to 27.7 mc (third overtone crystals).
Type of crystal	JAN CR-32/U.
Type of signals which can be received	F-m (15 kc deviation).
Number of tubes	22.
Intermediate frequencies	7.8 mc and 455 kc.
Power input	Suitable supply (Power Supply) PP-867/U, PP-868/U, or PP-869/U).
Audio frequency response	100 to 5000 cps (cycles per second).
Output impedance . . .	8 ohms.
Power output	6 watts at less than 10% distortion.
Antenna type	1/4 wave vertical.
Weight	26 lb (including power supply).
Special features	Squelch and muting circuits.

7. Technical Characteristics of Dynamotor-Power Supply DY-100/U

Dynamotor DY-93/U and Dynamotor DY-98/U (Transmitter Power Supplies)

Power input:

Dynamotor-Power Supply DY-100/U. .	6 volts dc. .	40 amp (amperes).
Dynamotor DY-93/U.	12 volts dc. .	20 amp.
Dynamotor-Power Supply DY-98/G	24 volts dc. .	10 amp.

Power output:

380 volts dc.	180 ma (milliamperes).
225 volts dc.	70 ma (available at pin 9 for Radio Transmitter T-278/U).
225 volts dc.	45 ma (available at pin 3 for Radio Transmitter T-208/U).
-25 volts dc.	5 ma.
24 volts ac	1.2 ma (Dynamotor-Power Supply DY-98/G).
6.3 volts ac (alternating current).	2 amp (Dynamotor-Power Supply DY-98/G).
6 volts dc	3 amp.
6 volts dc	.9 amp (Dynamotor-Power Supply DY-100/U and Dynamotor DY-93/U).
6 volts dc	2 amp. (Dynamotor-Power Supply DY-100/U and Dynamotor DY-93/U).
1.3 volts dc.	2 amp.
1.3 volts dc.	1 amp.

Adaptability to service conditions:

Altitude	10,000 feet, maximum.
Shocks and vibrations .	Will withstand shocks, strains, and vibrations in a vehicle traveling over rugged terrain.
Weather and climate . .	Fungiproofed and moistureproofed.
Normal operating temperature	-40° C (-40° F) to +65° C (149° F).
Weight	24 pounds.
Dimensions	14-1/2 in. (inches) long by 7 in. wide, by 8-5/8 in. high.

8. Technical Characteristics of Receiver Power Supplies PP-867/U, PP-868/U, and PP-869/U

Rated input power:

PP-869/U	6 volts	3.7 amp. dc.
PP-868/U	12 volts	2.0 amp. dc.
PP-867/U	24 volts	1.1 amp. dc.

Filament and heater circuit power drains:

PP-869/U	6.3-volt dc	.45 amp.
	6.3-volt dc	1 amp.
	1.4-volt dc	1.25 amp.
PP-868/U	6.3-volt ac	.45 amp.
	6.3-volt ac	1 amp.

	1.4-volt ac	1.25 amp.
PP-867/U	6.3-volt ac	.45 amp.
	24-volt dc	250 ma.
	1.4-volt dc	1.25 amp.

Plate, screen, and bias circuit power drains:

155-volt dc	15 ma.
150-volt dc	5 ma.
140-volt dc	50 ma.
-40-volt dc	.5 ma.

Adaptability to service conditions:

Altitude	10,000 feet
Shock and vibration	Will withstand shocks, strains, and vibrations in a vehicle operating over rugged terrain.
Weather and climate	Fungiproofed and moistureproofed.
Normal operating temperature	From -40° C (-40° F) to +70° C (+158° F).
Dimensions	5 inches high by 6-1/4 inches wide by 7 inches long.
Weight	10 pounds.

9. Packaging Data

Radio Set AN/VRC-19(*) is packaged for both domestic and export shipment when required. A single wooden packing case, divided into two compartments, contains the cartons of components for export shipment. In domestic packaging the wooden packing case is not used but is replaced by two cartons. The smaller individual cartons are packed the same for either type of shipment. A packing slip is attached to the outside of the case.

a. Export Packing. Radio Transmitter T-278/U, Radio Receiver R-394/U, and the transmitter and receiver power supplies are installed in Electrical Equipment Cabinet CY-938/VRC. This cabinet is fastened to Electrical Equipment Rack MT-1236/VRC as it would be for installation in a vehicle. Pads are used on all corners of the cabinet for shock protection. It is then inclosed in a water-resistant carton. The carton is sealed into a moistureproof-vaporproof bag. The bag is then placed into a second water-resistant carton which occupies the larger compartment of the wooden packing case. The smaller compartment of the packing case contains five cartons which contain the smaller components of the radio set. An illustration showing the method of packing the cartons in the packing case is shown in figure 16.

b. Contents of Cartons. The following is a list of the contents of each carton in the packing case:

Package No.	Item
1	Electrical Equipment Cabinet CY-938/VRC (with mtg brackets). Radio Transmitter T-278/U. Radio Receiver R-394/U. Dynamotor-Power Supply DY-100/U or Dynamotor DY-93/U or Dynamotor-Power Supply DY-98/G. Power Supply PP-867/U or Power Supply PP-868/U or Power Supply PP-869/U. Electrical Equipment Rack MT-1236/VRC.
2	Radio Set Control C-847/U.
3	Running Spares.
4	Special Purpose Electrical Cable Assembly CX-2341/U (control cable). Special Purpose Electrical Cable Assembly CX-2342/U (6-volt battery cable) Assembly CX-2343/U (24-volt battery cable).
5	Instruction books.
6	Handset H-33/PT.

10. Table of Components

The components (fig. 4) which make up the three models of Radio Set AN/VRC-19 (*) are listed below:

Component	Radio Set AN/VRC-19Y	Radio Set AN/VRC-19X	Radio Set AN/VRC-19	Dimensions of components			
				Height (in.)	Depth (in.)	Length (in.)	Weight (lb)
Radio Receiver R-394/U	1	1	1	8-1/2	14-9/16	5-13/16	17
Power Supply PP-869/U	1	0	0	5-1/8	7-1/16	6-1/4	9-3/4
Power Supply PP-868/U	0	1	0	5-1/8	7-1/16	6-1/4	10-1/4
Power Supply PP-867/U	0	0	1	5-1/8	7-1/16	6-1/4	10-1/4
Radio Transmitter T-278/U	1	1	1	8-1/2	14-1/2	4-1/2	8-3/4
Dynamotor-Power Supply DY-100/U	1	0	0	8-5/8	14-1/2	7	22-1/8
Dynamotor DY-93/U	0	1	0	8-5/8	14-1/2	7	22-1/8
Dynamotor-Power Supply DY-98/G	0	0	1	8-5/8	14-1/2	7	22-1/8
Electrical Equipment Cabinet CY-938/VRC (with hardware)	1	1	1	17-5/16	24-15/16	11-3/16	33-1/4
Electrical Equip ment Rack MT-1236/VRC	1	1	1	7-5/8	23-1/2	10-1/2	11
Radio Set Control C-847/U	1	1	1	5-3/4	3-9/16	9-1/4	5
Special Purpose Electrical Cable Assembly CX-2341/U (control cable)	1	1	1			235	
Special Purpose Electrical Cable Assembly CX-2342/U (6-volt battery cable)	1		0			192	

Component	Radio Set AN/VRC-19Y	Radio Set AN/VRC-19X	Radio Set AN/VRC-19	Dimensions of components			
				Height (in.)	Depth (in.)	Length (in.)	Weight (lb.)
Electrical Power Cable Assembly CX-2343/U (24-volt battery cable)	0	0	1			147	
Handset H-33/PT	1	1	1	2	2-1/4	7	1-1/16
Kit, running spares	1	0	0	5-3/8	6-5/8	9-7/8	
Kit, running spares	0	1	0	5-3/8	6-5/8	9-7/8	
Kit, running spares	0	0	1	5-3/8	6-5/8	9-7/8	
Instruction Book for Radio Set AN/VRC-19(*)	2	2	2	12	2	9	

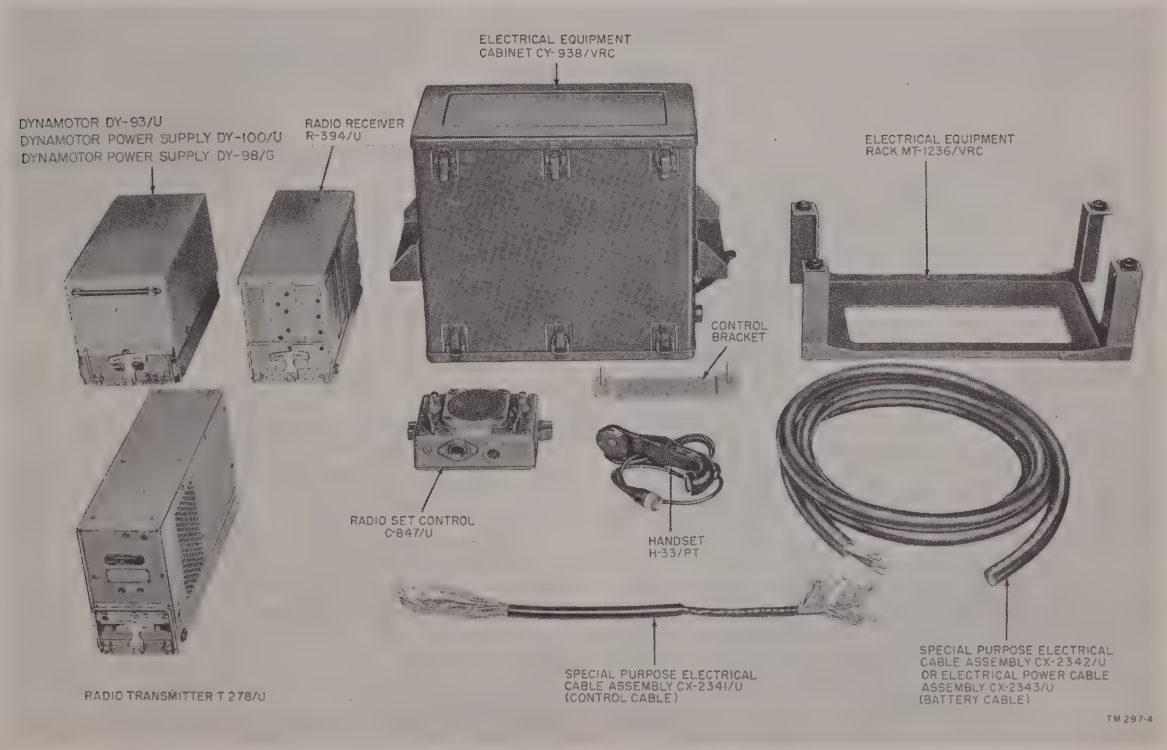

ELECTRICAL EQUIPMENT CABINET CY-938/VRC
DYNAMOTOR DY-93/U
DYNAMOTOR POWER SUPPLY DY-100/U
DYNAMOTOR POWER SUPPLY DY-98/G
RADIO RECEIVER R-394/U
ELECTRICAL EQUIPMENT RACK MT-1236/VRC
CONTROL BRACKET
RADIO SET CONTROL C-847/U
HANDSET H-33/PT
RADIO TRANSMITTER T-278/U
SPECIAL PURPOSE ELECTRICAL CABLE ASSEMBLY CX-2341/U (CONTROL CABLE)
SPECIAL PURPOSE ELECTRICAL CABLE ASSEMBLY CX-2342/U OR ELECTRICAL POWER CABLE ASSEMBLY CX-2343/U (BATTERY CABLE)
TM 297-4

Figure 4. Components of Radio Set AN/VRC-19(*).

10. Table of Components (contd).

Component	Radio Set AN/VRC-19Y	Radio Set AN/VRC-19X	Radio Set AN/VRC-19	Dimensions of Components				
				Height (in.)	Depth (in.)	Length (in.)	Volume (cu. ft.)	Weight
Instruction Book for Radio Receiver R-394/U	2	2	2	8-1/2	1	11		
Instruction Book for Radio Transmitter T-278/U	2	2	2	8-1/2	1	11		
Instruction Book for Power Supplies PP-867/U, PP-868/U, and PP-869/U	2	2	2	8-1/2	1	11		
Instruction Book for Dynamotor Power Supply DY-100/U, and Dynamotor DY-93/U and Dynamotor-Power Supply DY-98/G	2	2	2	8-1/2	1	11		

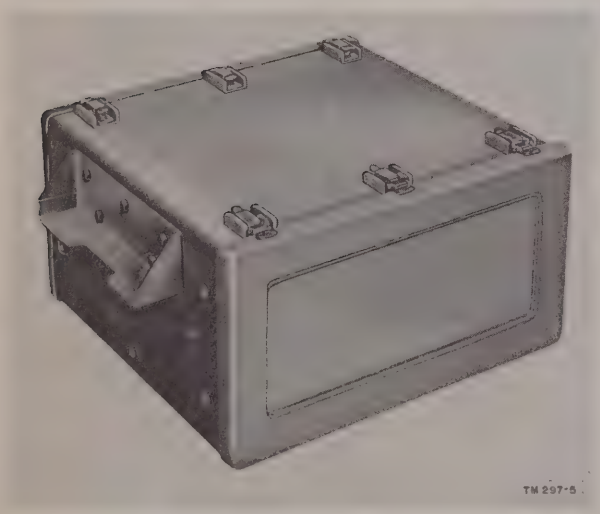


Figure 5. Electrical Equipment Cabinet CY-938/VRC.

11. Description of Electrical Equipment Cabinet CY-938/VRC (fig. 5)

Electrical Equipment Cabinet CY-938/VRC is used to house the receiver, transmitter, and transmitter power supply of Radio Set AN/VRC-19(*). It is made of aluminum with spot-welded construction and is coated with a semigloss olive drab enamel. The cabinet is made up of three main pieces which are the cabinet body and two covers. These covers are identical and are held on by six spring-loaded trunk type latches. The gasket-fitted covers are used for waterproofing the cabinet. Nine threaded holes, in a pattern to permit two types of mounting, are provided on each side of the cabinet. Two brackets fasten to the sides to permit the cabinet to be installed on Electrical Equipment Rack MT-1236/VRC. Two entrance holes are provided on the side of the cabinet for battery and control cables (fig. 32). The inside of the cabinet has rails which are spring loaded. When the components are installed in the cabinet, these rails firmly hold them. Jacks are provided in the rear of the cabinet to interconnect the three plug-in components. Terminal boards are mounted at the rear to allow

connection of the component jacks to external circuits. A fuse which is replaceable from the front protects the primary power source. The cabinet is 17-5/16" long by 11-13/16" wide by 17-5/16" high.

12. Description of Radio Transmitter T-278/U (fig. 6)

Radio Transmitter T-278/U is a crystal-controlled f-m transmitter capable of operation in the vhf range of 152 to 174 mc. It uses 12 tubes and has an r-f output of approximately 30 watts. Two separate oscillators are used to permit a choice of two preset frequencies. The frequency modulation is accomplished by the phase shift method which permits direct crystal control of the carrier frequency.

a. The transmitter is not self-contained but depends upon a separate power supply for power and a control unit for operating controls. The transmitter is a plug-in type component which automatically connects to other components in the radio set when plugged into Electrical Equipment Cabinet CY-938/VRC. The connection is made by a multi-contact single connector at the rear. The front panel of the transmitter contains the controls and test points for alining the transmitter. A folding handle provides a means of removing the transmitter from the cabinet when replacement, tuning, or repair is necessary.

b. In order that the transmitter may operate from a vehicle, a separate power supply must be used. Refer to paragraph 15 for a description of the power supplies.

c. A vertical antenna which is cut for a quarter-wave length of the operating frequency is coupled to the transmitter through a length of coaxial Radio Frequency Cable RG-58/U. An antenna changeover relay is incorporated in the circuit so that the same antenna can be used for reception when the transmitter is disabled. The relay also prevents the receiver from being damaged during transmission.

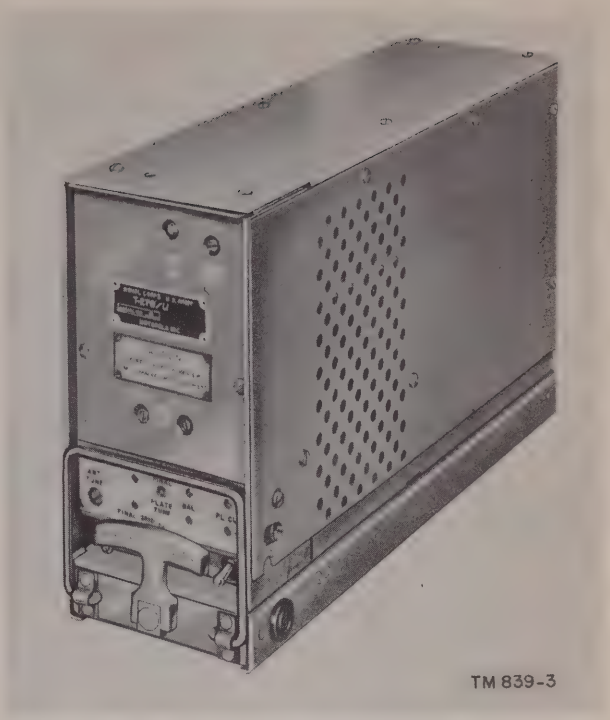


Figure 6. Radio Transmitter T-278/U.

13. Radio Receiver R-394/U (fig. 7)

a. Radio Receiver R-394/U is a 22-tube f-m dual conversion super-heterodyne receiver. It operates at a fixed frequency within the range of 152 to 174 mc. The high-frequency oscillators are crystal controlled to provide maximum stability. The receiver is connected to the radio set by means of a single multi-pin connector on the rear of the receiver. Connections are automatically made to other components when the receiver is installed in Electrical Equipment Cabinet CY-938/VRC. No controls are provided on the receiver proper; all controls are located on Radio Set Control C-847/U.

b. The receiver is made up of a main chassis or base assembly with plug-in sub-assemblies for the various groups of stages. The base has interconnecting wiring and jacks to complete the signal and current paths through the receiver. Each sub-assembly occupies a shielded compartment and is further shielded by a metal sleeve between the sub-assembly and compartment walls.

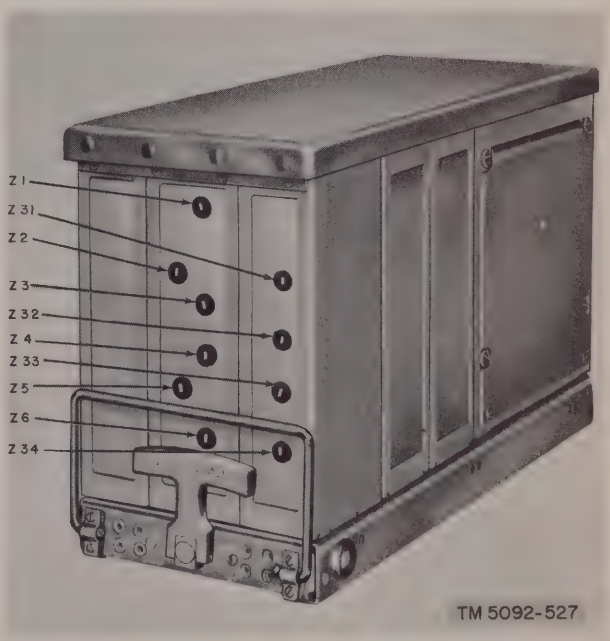


Figure 7. Oblique view of Radio Receiver R-394/U.

c. The receiver can be made to operate at a frequency different from that which was initially set up. To accomplish this, it is necessary to change the crystal in the high frequency oscillator and to realine all the stages preceding the first mixer. This operation is not to be attempted by the operator, but must be performed by a competent radio repair man who is familiar with the repair techniques of this equipment.

d. One of the receiver compartments is designed to accommodate the receiver power supply which is a separate component. The power supply, which is plugged into the receiver, must be capable of operating at the correct input voltage for the radio set in which it is installed. The receiver is designed to use Power Supply PP-869/U, Power Supply PP-868/U, or Power Supply PP-867/U for 6-, 12-, or 24-volt operation respectively. See paragraph 16 for a description of the power supplies.

14. Radio Set Control C-847/U (fig. 8)

Radio Set Control C-847/U is used to control the operation of Radio Set AN/VRC-19(*). It consists of a small, ruggedized, waterproof, metal box which contains front panel controls and a speaker for monitoring purposes. It is mounted either at the radio set or at some other location in the vehicle, usually, the instrument panel. Mounting is accomplished by means of two flanges on each side of the case. These flanges are slotted so that they will mate with the stud bolts on the mounting bracket (fig. 13). The bracket is semi-permanently fastened to the vehicle or Electrical Equipment Cabinet CY-938/VRC which allows the control to be removed easily for repair. Since the mounting bracket is not used in some installations, it is supplied with the installation kit instead of with the radio set. The control unit contains 4 controls, 2 pilot lamps, a speaker, audio resistor pads, and connectors. When used with Radio Set AN/VRC-19(*) it provides the following functions:

a. Turns power on and off for the radio set.

b. Indicates when the power is on.

c. Indicates when the transmitter is on.

d. Selects either of two preset transmitter frequencies.

e. Controls the receiver squelch threshhold level, and provides a means of disabling the squelch circuit.

f. Controls the volume of the monitor speaker and handset phone.

g. Provides interconnection to the handset from the receiver and transmitter thereby permitting push-to-talk operation.

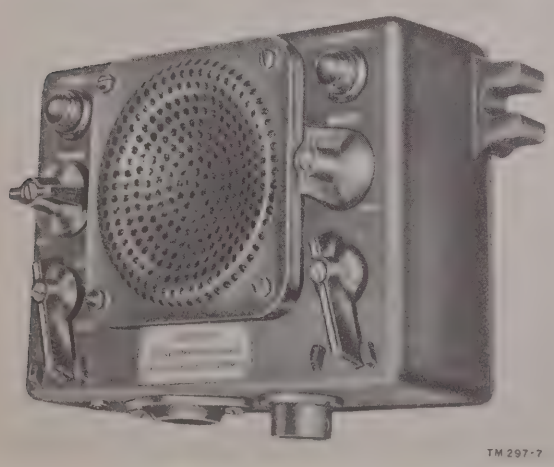


Figure 8. Radio Set Control C-847/U.

Figure 9. Dynamotor-Power Supply DY-100/U (transmitter)

15. Description of Transmitter Power Supplies (fig. 9)

a. There are three models of the d-c transmitter power supply available to operate with Radio Set AN/VRC-19(*). The power supply unit is located in Electrical Equipment Cabinet CY-938/VRC between the receiver and transmitter, and uses the same type of interconnection as those two components. The purpose of the power supplies is to change the 6-, 12-, or 24-volt battery source voltage to

the voltages required to operate Radio Transmitter T-278/U. Beside this function, the power supplies also contain circuits which aid in the control of the radio set.

b. Dynamotor-Power Supply DY-100/U (6 volts), Dynamotor DY-93/U (12 volts), and Dynamotor-Power Supply DY-98/G (24 volts) are used in conjunction with Radio Sets AN/VRC-19Y, -19X, and -19 respectively. Figure 9 is representative of all three models of the power supply. With the top covers off, the 6- and 12-volt models are almost identical, however, the 24-volt model differs in appearance because of added parts which are necessary for additional filtering.

c. The use of dynamotors limits the continuous operation time of the transmitter to 3 minutes. To prevent dynamotor overheating, an interval of at least 12 minutes should elapse before the transmitter is used again.

16. Receiver Power Supplies (fig. 10)

The receiver power supply is contained on a separate chassis which is designed to occupy a compartment in the receiver. Three different models are available to provide operation with vehicular voltages of 6, 12, or 24 volts. Interconnection to the receiver, power, and control circuits is made through a multi-pin connector which mates with a connector on the receiver base. There are no controls on the power supplies.

a. Power Supply PP-869/U is used with Radio Set AN/VRC-19Y to adapt Radio Receiver R-394/U to a 6-volt d-c power source. Power Supply PP-868/U permits the use of Radio Receiver R-394/U with Radio Set AN/VRC-19X which operates from a 12-volt d-c power source. The 24-volt version of the power supply is Power Supply PP-867/U and is used with Radio Set AN/VRC-19. Figure 10 is representative of all three of the power supply models.

b. The three models of the power supplies are almost identical in appearance and the differences can only be seen under the chassis. The main circuit differences lie in dropping the 12- or 24-volt source voltages to 6 volts and in the use of different vibrators.

17. Antenna

The antenna used with Radio Set AN/VRC-19(*) is not supplied with the radio set but is contained in one of two general purpose installation kits. One kit is used for hard-top vehicles such as sedans, ambulances, etc. and contains a 17-inch whip antenna which is vertically mounted at the center of the vehicle roof. The second installation kit is used for other than hard-top vehicles (jeeps,

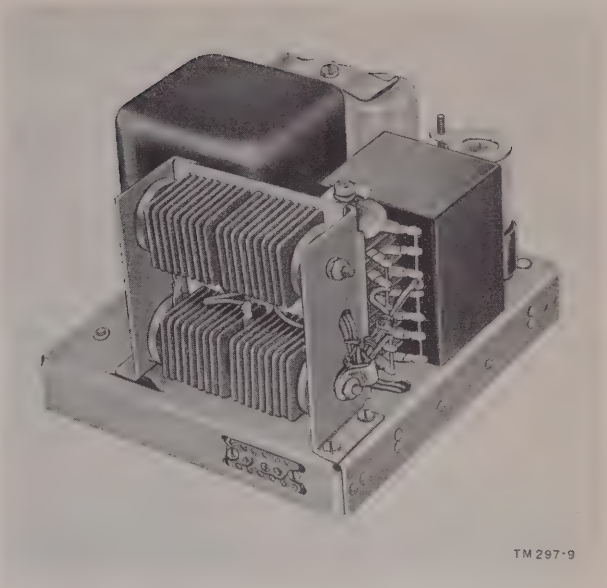


Figure 10. Power Supply PP-868/U (receiver).

command cars, etc.) and contains a coaxial antenna (fig. 11). This antenna consists of a wire (17 inches long) and skirt mounted on a supporting mast. The antenna is fed by coaxial cable (supplied with the antenna) which passes through the supporting mast. The height of the antenna may be adjusted by loosening the adjusting nut on the supporting mast. The supporting

Figure 11. Coaxial antenna mounted on jeep.

mast is connected to the mounting bracket by means of a spring to prevent damage when the antenna hits obstructions. See instructions, supplied with the installation kit, for installation details.

18. Electrical Equipment Rack MT-1236/VRC (fig. 12)

Electrical Equipment Rack MT-1236/VRC is a metal support which cradles Electrical Equipment Cabinet CY-938/VRC. The cabinet rests on four rubber shock mounts, each of which is on a post approximately 7 inches from the base. This keeps the cabinet from touching anything but the mounts and also permits two methods of mounting the cabinet. The base of the mount has 24 holes which will allow it to be secured to a vehicle in various ways.

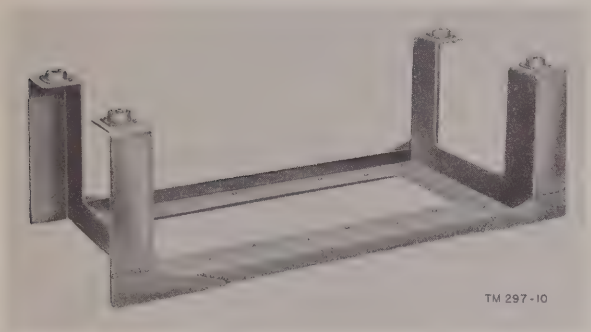


Figure 12. Electrical Equipment Rack MT-1236/VRC.

19. Control Bracket (fig. 13)

The control bracket is used to mount Radio Set Control C-847/U. It has three mounting holes which mate with the threaded holes on the side of Electrical Equipment Cabinet CY-938/VRC. Two studs are provided to hold the control with the aid of nuts and washers. Although the bracket is designed to secure the control to the cabinet it can also be used at other locations in the vehicles. Since the bracket is not used in all installations, it is supplied with the installation kit instead of with the radio set.

20. Handset H-33/PT (fig. 14) and Handset Holder

Handset H-33/PT is a combination microphone and receiver with a push-to-talk switch and connecting cord. Microphone impedance is 40 ohms; receiver impedance is 150 ohms. The push-to-talk switch consists of two electrically independent SPST (single-pole-single throw) switches. The cord is 5 feet long and is terminated in a 10-pin audio connector which mates with the HANDSET connector on Radio Set Control C-847/U. A handset holder is included with the equipment to provide a means of securing handset when it is not in use. The holder is packed with the spare parts and consists of a mounting bracket and clip assembly. The holder can be mounted on the radio set control or

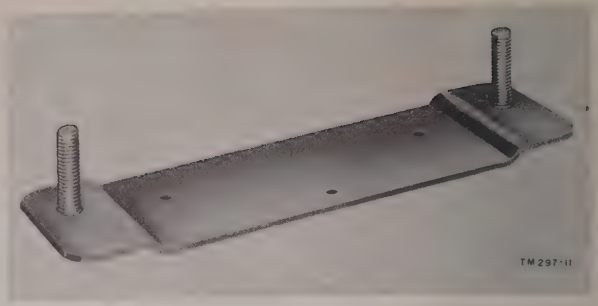


Figure 13. Control bracket.

other convenient location. See paragraph 26f for assembly and installation details.

21. Cables

a. Special Purpose Electrical Cable Assembly CX-2342/U and Electrical Power Cable Assembly CX-2343/U (Battery Cables). The battery cable (fig. 15) used with Radio Set AN/VRC-19(*) varies in characteristics depending upon the type of vehicle in which it is installed and the voltage of the electrical system. In a jeep installation, for instance, the cable is shorter than in a sedan or truck installation. The same current capacity wire can be used in both the 6- and 12-volt systems (Special Purpose Electrical Cable Assembly CX-2342/U), but it can be lighter in the 24-volt system (Electrical Power Cable Assembly CX-2343/U) because of the reduced current demand. All of the battery cables are made up of two insulated wires encased in a heavy duty rubber coating. The ends of the wires which connect to Electrical Equipment Cabinet CY-938/VRC have eye type lugs soldered to them.

b. Special Purpose Electrical Cable Assembly CX-2341/U (Control Cable). The control cable (fig. 4) consists of twenty wires cabled together and cut to conveniently reach between Radio Set Control C-847/U and Electrical Equipment Cabinet CY-938/VRC. In installations where the control is located on the cabinet, such as for jeeps, the cable is approximately 18 inches long. In other types of installations the length may be 16 feet or more. The lead which carries the microphone audio signal is shielded. This shield is grounded at the cabinet end only.

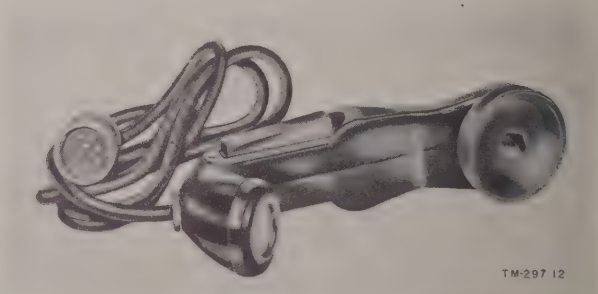


Figure 14. Handset H-33/PT.

Figure 15. Special Purpose Electrical Cable Assembly CX-2342/U (Battery Cable).

22. Running Spares

A group of running spares is supplied with each equipment. Spares are provided for all normally expendable items such as tubes, fuses, pilot lamps, vibrators, etc. Each of the three models of the equipment has a different set of running spares. In all models the running spares are packed in the same packing case with the equipment. The following list shows the running spares provided for the three models of the equipment.

Item	Equipment		
	Radio Set AN/VRC-19Y	Radio Set AN/VRC-19X	Radio Set AN/VRC-19
Tube, electron, type 1AD4	3	3	3
Tube, electron, type 5840	1	1	1
Tube, electron, type 5783	1	1	1
Tube, electron, type 5678	4	4	4
Tube, electron, type 6AK6	1	1	1
Tube, electron, type 5672	2	2	2
Tube, electron, type 2E24	2	2	2
Tube, electron, type 3B4	1	1	1
Tube, regulator, receiver power supply	2	2	2
Tube, regulator, transmitter power supply	4	4	4
Lamp, incandescent, 6 to 8v, .15A	1	1	1
Vibrator, 24v	0	0	2
Vibrator, 6v	1	0	0
Vibrator, 12v	0	1	0
Fuse, link type, 50 amp	2	2	2
Fuse, ceramic body cartridge type, 8 amp	2	0	0
Fuse, cartridge, 15 amps	2	0	0
Fuse, cartridge, 3 amp	0	0	5
Fuse, cartridge, 5 amp	0	5	0
Fuse, cartridge, 6 amp	0	0	2
Fuse, cartridge, 10 amp	0	2	0
Fuse, cartridge, 20 amp	0	0	2
Brush, dynamotor output	2	2	2
Brush, dynamotor input, 6v	2	0	0
Brush, dynamotor input, 12v	0	2	0
Brush, dynamotor input, 24v	0	0	2
Handset holder	1	1	1

23. Differences in Models

The radio set is available in three different models each designed to operate from a different source voltage. Basically the models are the same with the exceptions listed below:

Item	Radio Set AN/VRC-19Y	Radio Set AN/VRC-19X	Radio Set AN/VRC-19
Power Supply PP-869/U	X	-	-
Power Supply PP-868/U	-	X	-
Power Supply PP-867/U	-	-	X
Dynamotor-Power Supply DY-98/G	-	-	X
Dynamotor-Power Supply DY-100/U	X	-	-
Dynamotor DY-93/ U	-	X	-
Special Purpose Electrical Cable Assembly CX-2342/U (6- and 12-volt battery cable)	X	X	-
Electrical Power Cable Assembly CX-2343/U (24-volt battery cable)	-	-	X
Running spares (6-volt)	X	-	-
Running spares (12-volt)	-	X	-
Running spares (24-volt)	-	-	X

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF MATERIEL

24. Siting

a. Location in Vehicle. The location of Radio Set AN/VRC-19(*) in its operating position is largely determined by the vehicle in which it is installed. Refer to the special instructions issued for recommended installation in specific vehicles. It is beyond the scope of this instruction book to cover the mounting details for all vehicles, however, sufficient information is provided so that the important factors concerning installation are known. This should be an aid to the installer in all types of installations.

b. Effects of Surroundings. Best operation of the equipment can be expected when the surrounding terrain is flat or when the vehicle is on a hill. Intervening hills, cliffs, densely wooded areas, buildings and other obstructions can cause a serious reduction in the communication range. Depressions, valleys, and other low places are poor locations for radio reception and transmission because the surrounding high terrain absorbs r-f energy and reduces line of sight distance. Weak or otherwise undesirable signals may be expected if the set is operated under or close to steel bridges, underpasses, power lines, hospitals, or power units. Whenever possible, try to move the vehicle away from the undesirable locations when operating the radio set.

25. Uncrating, Unpacking, and Checking New Equipment

Caution: Use extreme caution during the unpacking process so that no damage occurs to the radio set or its accessories. Dropping the packing case or piercing the smaller cartons with a sharp instrument could cause severe damage to the inclosed pieces. Take the package apart in such a manner that no undue force is placed upon the contents. If possible, unpack the equipment in a location which is dry and free of dust or dirt. Follow the unpacking instructions in the order given to provide the most rapid means of safely removing the equipment from the crate. Refer to figure 16 to familiarize yourself with the construction of the packages.

a. Unpacking.

(1) Cut the metal bands which encircle the wooden packing case. Use a pair of tin snips or a large pair of diagonal cutting pliers rather than forcing the bands off by some other method.

(2) Pry open the top cover, being careful not to force the prying instrument too far into the package. Remove the top cover and save it for possible repacking (save all the packaging material except the silica gel for this reason).

(3) Take out the small packages containing the instruction books, running spares, cables, etc.

(4) The packing case can now be laid on its side and the large package containing Electrical Equipment Cabinet CY-938/VRC and components may be slid out.

(5) Open the flaps on the cartons and remove their contents.

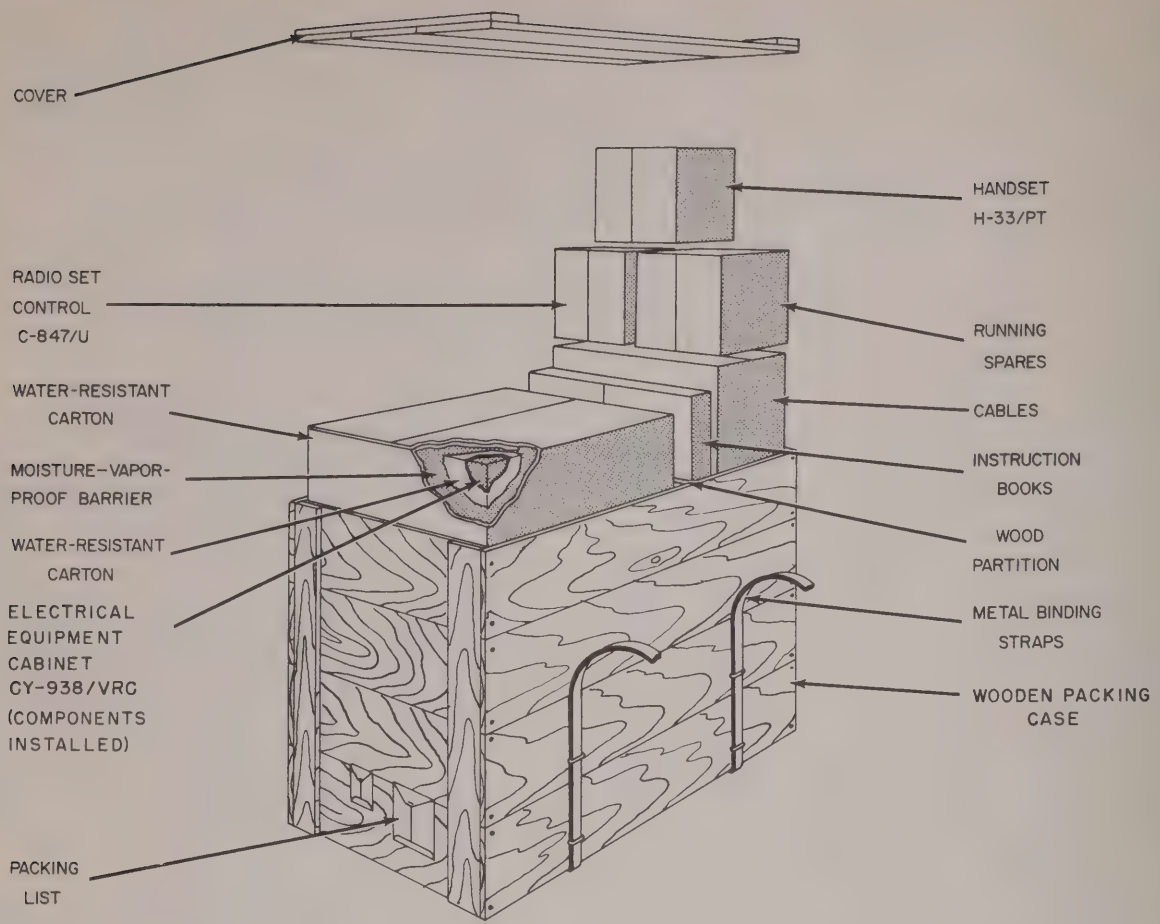
(6) Slit the moistureproof-vaporproof bag (in the large carton) along its seam and remove the cabinet.

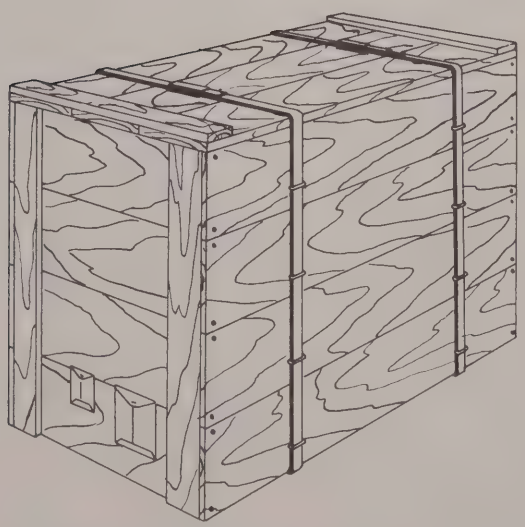
(7) The individual spare parts and accessories are each wrapped and marked separately. Remove the wrappings of all the parts to be used.

(8) The unpacking procedure is now complete and the radio set is ready for further checks.

b. Checking. Always check equipment for possible damage which may have occurred during shipment. Make sure that all the parts listed in the packing list are accounted for. The packing list is in an envelope tacked to the outside of the packing case.

c. Repacking. To repack the radio set, reverse the procedure given for unpacking.





NOTE:

CORNER PADS ARE PLACED ON ALL EIGHT CORNERS OF ELECTRICAL EQUIPMENT CABINET CY-938/VRC.

TM 297-14

Figure 16. Export packaging of Radio Set AN/VRC-19(*).

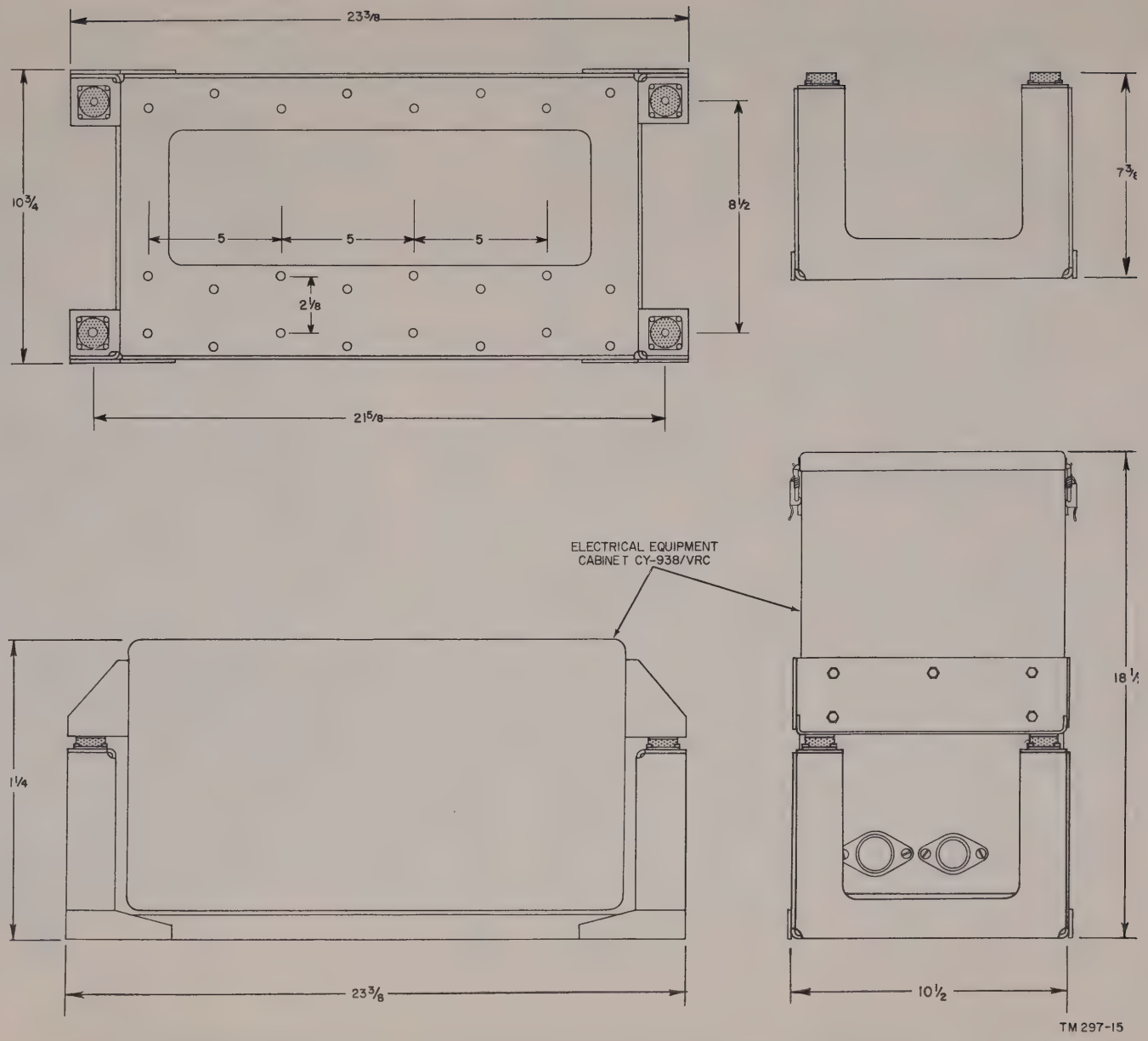


Figure 17. Dimensional drawing of Electrical Equipment Rack MT-1236/VRC and Electrical Equipment Cabinet CY-938/VRC.

26. Installation of Equipment

a. General. When the equipment is being installed, bear in mind that it is necessary to remove the two covers on Electrical Equipment Cabinet CY-938/VRC to make wiring changes and connections. Refer to paragraph 27 before doing the actual installation so the connections can be made with the least difficulty. Figure 17 is a dimensional drawing which shows the mounting hole spacing and overall dimensions of the cabinet mounted on the cabinet support. There are two methods of mounting the cabinet. The method in which the front panels of the components are facing upward will be called the vertical mounting, and the method with the front panels of the components facing to the side will be called horizontal mounting. The cover of Electrical Equipment Cabinet CY-938/VRC which covers the terminal boards will be referred to as the rear cover.

b. Electrical Equipment Rack MT-1236/VRC Installation. Electrical Equipment Rack MT-1236/VRC is installed in the vehicle where a mounting surface or other suitable location is available. If possible, locate the rack where there will be enough surrounding space to allow access to both the front and rear of Electrical Equipment Cabinet CY-938/VRC. In some vehicles the necessary mounting holes will already be drilled and perhaps threaded, however, in most vehicles it will be necessary to drill these holes. Use a template of paper or cardboard as a guide to correctly space the holes. The dimensions can be found in figure 17. About 6 equally spaced holes are sufficient to accommodate the bolts for securing the mount. Use 1/4-inch bolts and lockwashers. Nuts are to be used on the other side of the mounting surface if the holes are not threaded.

c. Installing Electrical Equipment Cabinet CY-938/VRC. Electrical Equipment Cabinet CY-938/VRC is installed on Electrical Equipment Rack MT-1236/VRC by means of four bolts. The necessary bolts, nuts, and washers are supplied with the cabinet as hardware. The two side brackets on the cabinet must be fastened in the correct position depending on the method in which the cabinet is to be mounted. (The two methods of mounting are shown in figure 18). They are held by 5 bolts, each of which is screwed into the threaded holes on the sides of the cabinet. The bracket installed for horizontal mounting can be seen in figure 5. Two bracket mounting positions are shown in figure 19.

d. Installing Control Bracket. The radio set control bracket has three mounting holes. These holes match up with the three holes provided on the side of Electrical Equipment Cabinet CY-938/VRC when the cabinet is mounted vertically. The bracket can be mounted on some other surface if a longer control cable (20-wire) is used. When the bracket is installed on another surface, 3 additional holes must be drilled. Make sure the bracket is placed

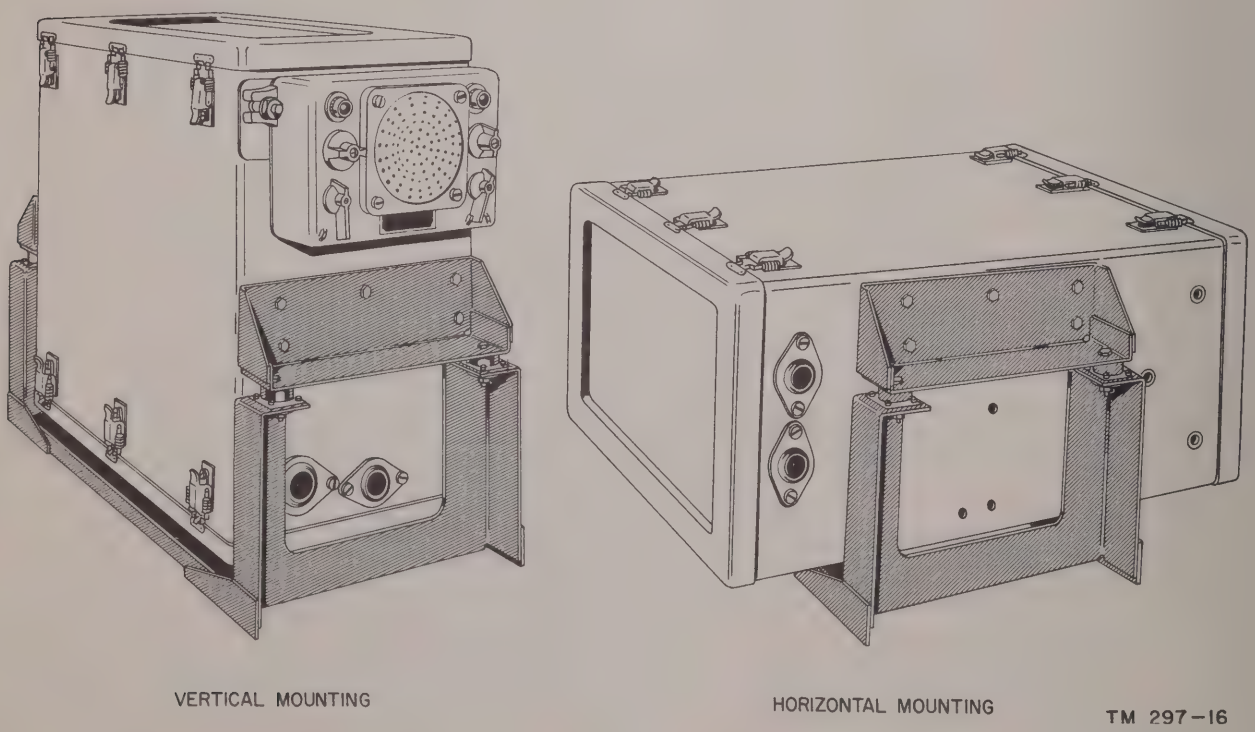


Figure 18. Methods of Mounting Electrical Equipment Cabinet CY-938/VRC.

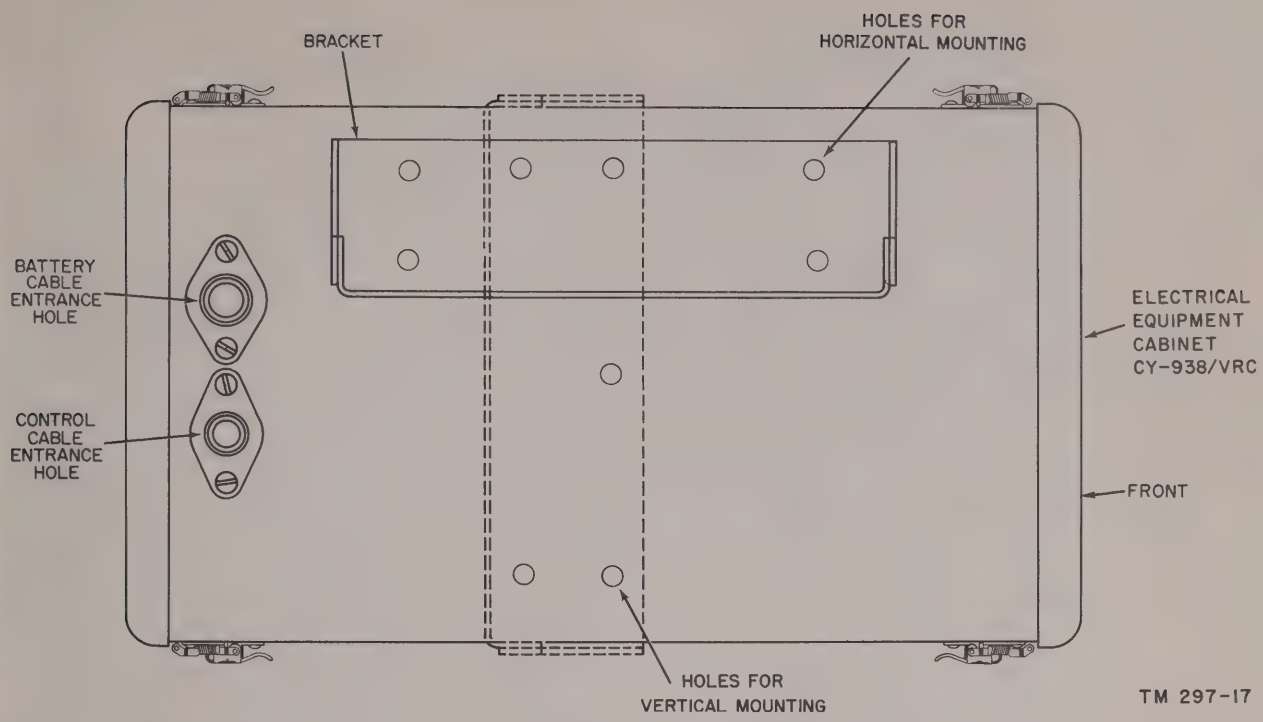


Figure 19. Installation of Electrical Equipment Cabinet CY-938/VRC bracket

so that no obstacles will be encountered when attaching the control. The bracket is supplied with the installation kit when necessary.

e. Installing Radio Set Control C-847/U. To install Radio Set Control C-847/U, place it flush against the control bracket so that the two flanges aline with the studs on the control bracket. Place washers over the studs, then secure the control with two nuts. Where the control is to be mounted without using the control bracket, secure the control to the mounting surface with suitable bolts and washers. Refer to paragraph 27 for control connections, before installing the control.

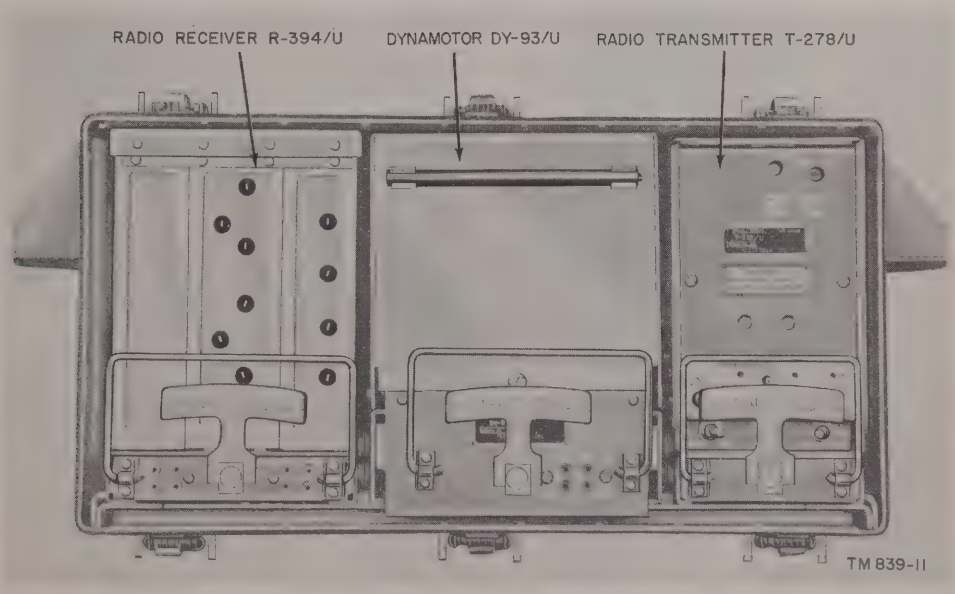
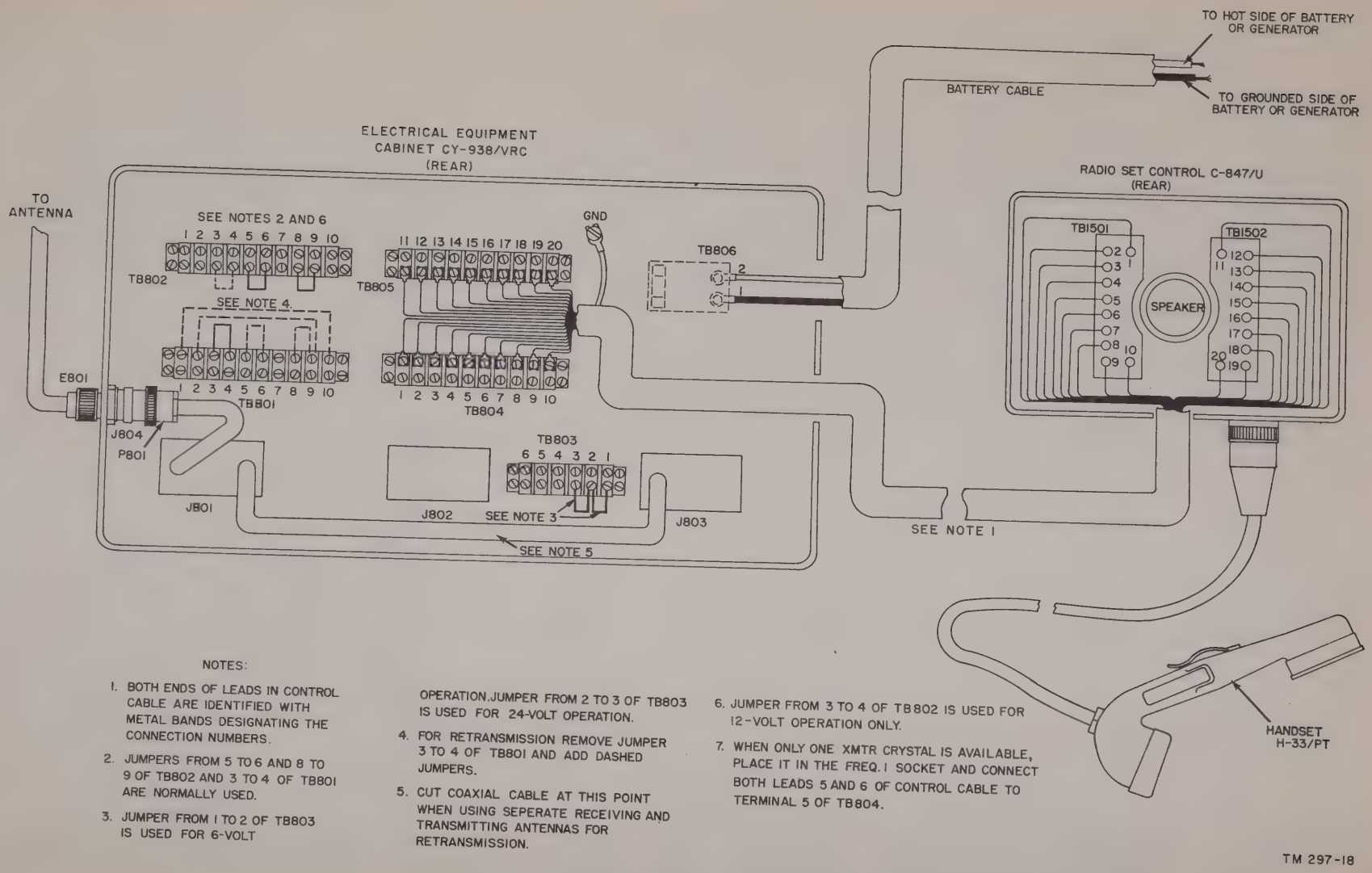


Figure 20. Electrical Equipment Cabinet CY-938/VRC with components installed.



NOTES:

1. BOTH ENDS OF LEADS IN CONTROL CABLE ARE IDENTIFIED WITH METAL BANDS DESIGNATING THE CONNECTION NUMBERS.
2. JUMPERS FROM 5 TO 6 AND 8 TO 9 OF TB802 AND 3 TO 4 OF TB801 ARE NORMALLY USED.
3. JUMPER FROM 1 TO 2 OF TB803 IS USED FOR 6-VOLT OPERATION. JUMPER FROM 2 TO 3 OF TB803 IS USED FOR 24-VOLT OPERATION.
4. FOR RETRANSMISSION REMOVE JUMPER 3 TO 4 OF TB801 AND ADD DASHED JUMPERS.
5. CUT COAXIAL CABLE AT THIS POINT WHEN USING SEPERATE RECEIVING AND TRANSMITTING ANTENNAS FOR RETRANSMISSION.
6. JUMPER FROM 3 TO 4 OF TB802 IS USED FOR 12-VOLT OPERATION ONLY.
7. WHEN ONLY ONE XMTR CRYSTAL IS AVAILABLE, PLACE IT IN THE FREQ. 1 SOCKET AND CONNECT BOTH LEADS 5 AND 6 OF CONTROL CABLE TO TERMINAL 5 OF TB804.

Figure 21. Connections for Radio Set AN/VRC-19(*).

f. Installing Handset Holder. The handset holder consists of an L shaped bracket and a clip assembly, and is packed with the spare parts kit. The clip can be used separately, or in conjunction with the bracket depending on the installation. When using both parts, the clip is fastened to the bracket by means of two holes provided in the bracket. The clip or clip and bracket assembly can be mounted at any convenient location consistent with the length of the control cable.

g. Assembly of Components in Electrical Equipment Cabinet CY-938/VRC. Access to the components in Electrical Equipment Cabinet CY-938/VRC is gained by six spring type latches. The rear cover is identical to the front cover. Before installation of the radio set is completed, remove each of the components, and examine them for damage. This damage may consist of broken tubes, resistors, cut wires, shorted terminals, bent capacitor plates, smashed transformer cans, etc. Each of the components (receiver, transmitter, and transmitter power supply) is held in place by one nut type fastener. The nut is at the back of the component and has an extension to the front panel. This slotted front panel extension is turned counterclockwise to release the component. The component may be slid out from the cabinet without disconnecting any wires since all connections are made by means of the multipin connectors at the rear of the components. Remove the two side panels of the transmitter to check the tubes and other parts. The receiver top cover is held by a single latch at the rear of the receiver. Removing this cover allows any of the plug-in units to be pulled out with the exception of the receiver power supply. To remove the power supply, it is necessary to also remove the side cover which is held by two Airloc fasteners. After the cover is removed take out the six screws retaining the power supply. The power supply can then be pulled from the chassis and at the same time the plug to the receiver base can be disconnected. The transmitter power supply cover is held on by six screws. It is not necessary to completely remove the screws because the cover has open slots to permit it to be lifted from the power supply. When all of the components have been checked and it is reasonably sure that there is no visual indication of damage, the components should be reinstalled in the cabinet. This is done by placing the rear of the component on the rails in the proper section of the cabinet and sliding it into the cabinet until the plug on the component and the socket on the cabinet are engaged, then tightening the front panel holding nut securely. Figure 20 shows the components installed in the cabinet.

27. Connections (fig. 21)

a. General. The method of mounting Electrical Equipment Cabinet CY-938/VRC will determine to some extent the sequence of connections for Radio Set AN/VRC-19(*). The input cables from the power source are connected from the front of the cabinet with the receiver removed. All other connections are made with the rear cover of the cabinet removed. This condition permits connections to be made after installation only if there is access to both the front and the rear of the cabinet. If this is not possible some of the connections will have to be made during the installation procedure. Refer to figure 21 for the connections to be made in Radio Set AN/VRC-19(*).

b. Power Connections.

Caution: DO NOT CONNECT CABLES TO THE POWER SOURCE (BATTERY OR GENERATOR) UNTIL ALL OTHER CONNECTIONS HAVE BEEN MADE.

The radio set ends of the battery cables have lugs for connection. They are to be connected in the following manner:

(1) Remove the front cover of Electrical Equipment Cabinet CY-938/VRC.

(2) Remove Radio Receiver R-394/U if it has previously been installed.

(3) Feed the ends of the battery cables through the top cable hole at the left side of the cabinet.

(4) Connect the leads to terminals 1 and 2 of terminal board TB806. The hot lead goes to 1 and the grounded side of the battery goes to 2.

(5) Make sure that a good 50-ampere fuse is securely in place in the fuseholder.

(6) After the connections are made, replace the receiver in its former location.

c. Jumper Connections. The power supplies require certain external connections (located in the cabinet) to be properly connected in the receiver and transmitter circuits. Remove the rear cover from Electrical Equipment Cabinet CY-938/VRC. Use the following connections in the three models of the radio set:

(1) In Radio Sets AN/VRC-19, -19X, and -19Y place a jumper between terminals 3 and 4 of TB801, between terminals 5 and 6 of TB802, and terminals 8 and 9 of TB802.

(2) In Radio Set AN/VRC-19 (6-volt model), place a jumper between terminals 1 and 2 of TB803.

(3) In Radio Set AN/VRC-19X (12-volt model) place a jumper between terminals 3 and 4 of TB802.

(4) In Radio Set AN/VRC-19 (24-volt model) place a jumper between terminals 2 and 3 of TB803.

Note: It is possible to make the transmitter tube filaments operate continuously (at reduced voltage during reception) by jumping two terminals in the transmitter power supply (see notes 5 in figures 57, 58, and 59). Refer to the transmitter power supply instruction book for connection details.

d. Control Connections. Feed the control cable (spade lug end) through the lower cable hole on the left side of Electrical Equipment Cabinet CY-938/VRC. Each wire of the cable is marked with a metal tag bearing a number. The numbers match terminal numbers of terminal boards TB804 and TB805. Connect each wire to its mating terminal on these boards. The heavy braided lead should be secured under the screw marked GND. Feed the control end of the cable, which has pin tip type connectors, through the hole provided in the bottom of Radio Set Control C-847/U. The ends of these wires are also marked with metal bands and indicating numbers. Plug each wire tip into its mating jack on terminal boards TB1501 and TB1502 in the control. After making these connections, replace the rear cover on the control unit.

Note: When only one crystal is available for Radio Transmitter T-278/U, place it in the frequency #1 crystal socket. Connect both leads 5 and 6 of the control cable from Radio Set Control C-847/U to terminal 5 of TB 804. This permits the transmitter to operate in either position of the frequency selector switch.

e. Retransmission Connections. When retransmission operation is required, it is necessary to use separate antennas for the receiver and transmitter. It is also necessary to place jumper connections properly in Electrical Equipment Cabinet CY-938/VRC and Radio Receiver R-394/U to permit the audio output of the receiver to modulate the transmitter and to turn the transmitter on when receiving. In the cabinet, remove the jumper from terminals 3 and 4 of TB801 and connect jumpers between terminals 1 and 10, 5 and 6, 2 and 9, and 7 and 9 of TB801. Cut the coaxial cable between J801 to J803 at its approximate mid-point and splice the end connected to J803 to another piece of coaxial cable. Connect the end of the added cable to a separate antenna. In the receiver, remove the end of the jumper connected to terminal 9 of TB251 and connect it to terminal 11 of TB251.

f. Battery Polarity. Provision is made in Radio Set AN/VRC-19(*) to operate when either the positive or the negative terminal of the vehicle battery is grounded to the chassis. Polarity of the battery does not effect any of the components except the transmitter power supply. If the transmitter power supply dynamotor output is not of the correct polarity, a negative high voltage will be applied to the transmitter instead of a positive voltage. This can be remedied by reversing the output connections of the power supply dynamotor. To do this, it is necessary to remove the transmitter power supply from Electrical Equipment Cabinet CY-938/VRC, take off its top cover, and reverse the pin type jacks located at the rear of the dynamotor. The polarity can be checked at the front panel of the power supply. It is only necessary to place a d-c voltmeter across the terminals marked -25v and +380v with the positive terminal of the meter at the +380v terminal. If the voltmeter reads up-scale the polarity is correct. After changing the polarity, replace the power supply in the cabinet. Refer to figure 35 for the location of the connections that change the polarity.

28. Service Upon Receipt of Used or Reconditioned Equipment

a. Refer to the instructions given in paragraphs 9 and 25 when repacking used or reconditioned equipment.

b. If used equipment is received for service, check for tags or other sources of information regarding the condition of the equipment. When the condition is doubtful and no information is available, perform the testing procedures described in chapter 3, section III, and in chapter 5. A thoroughly reconditioned piece of equipment may be considered to be in the same condition as new equipment and instructions for operation given in chapter 2 may be followed.

Section II. CONTROLS AND INSTRUMENTS

29. Controls and Their Uses

The controls used for normal operation after the radio set is installed and initially operated are located on Radio Set Control C-847/U. These controls are not complicated, however, an understanding of their functions will enable the operator to take advantage of the service that can be provided with proper control settings. The other controls and test points are located on the transmitter, transmitter power supply, and receiver. They are used mainly in checking the radio set for proper operation, initial tune up procedures, and maintenance procedures.

30. Radio Set Control C-847/U Controls (fig. 22)

Control	Function
VOLUME-OFF (S1501) switch	Turns on the power to the radio set, and controls the volume level of the handset receiver and the speaker through an attenuator network. Four volume levels are available.
SPKR ON-OFF (S1502) switch	Connects the speaker across the handset receiver in the ON position. In the OFF position, disconnects the speaker and replaces it with a 10-ohm resistor. The switch is spring-loaded and must be held in the OFF position.
POWER indicator (I 1501)	Lights whenever the VOLUME switch is in any position but OFF. Indicates that power is applied to the receiver.
TRANSMIT indicator (I 1502)	Lights when the push-to-talk switch on the handset is closed. Indicates that the transmitter is in operation and the receiver is disabled.
SQUELCH-OFF control (R1509 and switch (S1504)	Disables the receiver squelch circuit with the SQUELCH control in the OFF position. In other positions the control sets the "threshold" of squelch operation.
FREQ 1 - 2 switch (S1503)	Selects either of two preset transmitter frequencies. The selection is made by supplying filament power only to the transmitter oscillator being used.
HANDSET connector (J1501)	Is located on the bottom of the control and provides a connection between the handset, and the receiver and transmitter.
Speaker	Is provided to enable the operator to hear the incoming signals without having to continually hold the handset to his ear. This feature is especially helpful for operation while the vehicle is in motion or when more than one person desires to listen.

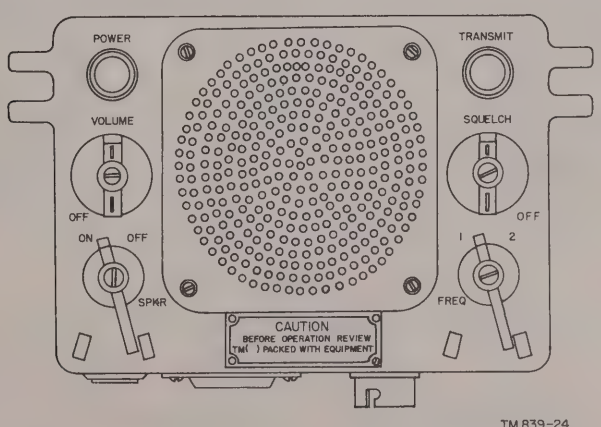


Figure 22. Front panel of Radio Set Control C-847/U.

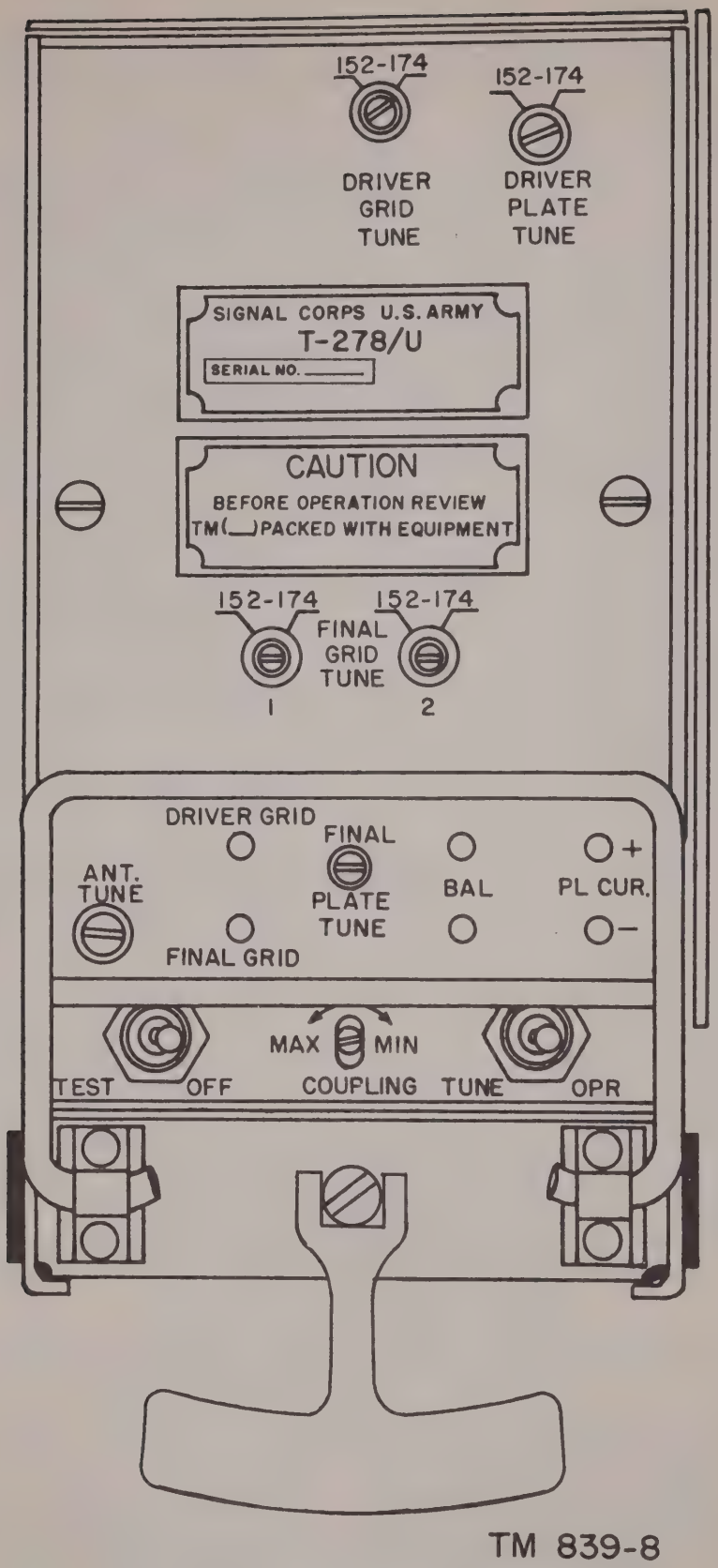


Figure 23. Front panel of Radio Transmitter T-278/U.

31. Radio Transmitter T-278/U Controls (not for operator's use) (fig. 23)

Control	Function
TEST-OFF switch (S402)	In the TEST position, energizes a relay in the transmitter power supply to provide power for the transmitter. In the OFF position, power is applied to the transmitter by operation of the push-to-talk switch on Handset H-33/PT.
TUNE-OPR switch (S401)	In the TUNE position, reduces screen voltage applied to the fifth doubler and driver and the power amplifier tubes. In the OPR position, allows normal screen voltage to be applied to the above tubes.
DRIVER GRID TUNE 152-174 control (C429)	Tunes the fifth doubler and driver grid tank circuit to resonance.
DRIVER PLATE TUNE 152-174 control (C436)	Tunes the fifth doubler and driver plate tank circuit to resonance.
FINAL GRID TUNE 1 152-174 control (C439)	Tunes the grid tank circuit of the power amplifier tubes to resonance.
FINAL GRID TUNE 2 152-174 control (C437)	Tunes the grid tank circuit of the power amplifier tubes to resonance.
FINAL PLATE TUNE control	Tunes the power amplifier plate circuit to resonance by means of a shorting bar across the plate circuit lines.
COUPLING MAX-MIN control (L412)	Varies the coupling between the power amplifier plate lines and the output link.
ANT. TUNE control (C451)	Acts as the antenna loading adjustment.
DRIVER GRID jack (J405)	Test point for checking grid voltage during tuning of the fifth doubler and driver stage.
FINAL GRID jack (J406)	Test point for checking grid voltage of the power amplifier during tuning procedure.
BAL jacks (J407 and J408)	Test points for checking the balance (equality of plate current) at the push-pull power amplifier stage during tuning procedure.
PL CUR. +- jacks (J409 and J410)	Test points for checking plate current of the power amplifier stage when tuning adjusting for proper loading of the transmitter.
DEVIATION LEVEL control (R452, not accessible from front panel, see Fig. 26)	Controls the amount of deviation of the transmitted signal by varying the magnitude of the audio applied to the phase modulator.
FREQ 1 control (C403, not accessible from front panel, see Fig. 26)	Provides fine tuning adjustment of the frequency one oscillator V401.
FREQ 2 control (C404, not accessible from front panel, see Fig. 26)	Provides fine tuning adjustment of the frequency two oscillator V402.

32. Radio Receiver R-394/U Test Points (fig. 24)

Test point	Function
1-LO jack	Used to measure d-c voltage at the control grid of first mixer tube V3.
2-RF jack	Used to measure d-c voltage at the control grid of 7.8-mc i-f amplifier tube V51.
3-1ST IF jack	Used to measure d-c voltage at the control grid of first 455-kc i-f amplifier tube V81.
4-2ND IF jack	Used to measure d-c voltage at the control grid of fifth 455 kc amplifier tube V85.
5-DISCR jack	Used to measure d-c output of the discriminator circuit.
6-FIL. jack	Used to check the 1.4-volt d-c filament voltage.
7-B+ jack	Used to check the +145-volt d-c plate supply voltage.
8-GND jack	Provides a common ground connection for external meter measurements.

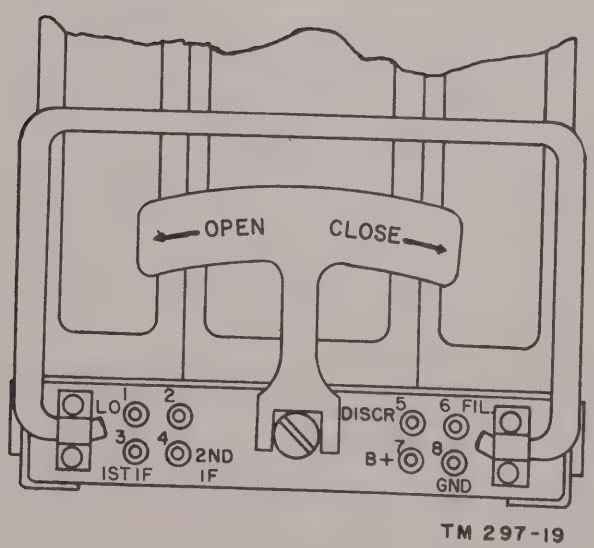


Figure 24. Radio Receiver R-394/U front panel test points.

33. Transmitter Power Supply Test Points (fig. 25).

Test point	Function
1.3V jack	Used to test for 1.3-volt filament supply output.
-25V jack	Used to test for 25-volt bias supply output.
+225V jack	Used to test for 225-volt B+ supply output.
+380V jack	Used to test for 380-volt B+ supply output.

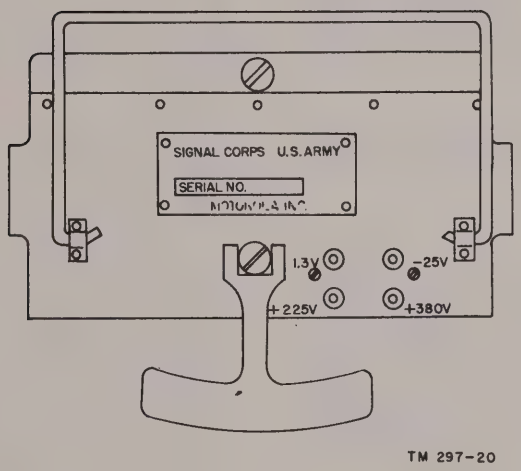


Figure 25. Dynamotor DY-93/U and Dynamotor-Power Supplies DY-98/G and DY-100/U, front panel test points.

Section III. PRELIMINARY STARTING AND STARTING PROCEDURES

34. Starting Procedure

a. Preliminary. Set the controls on Radio Set Control C-847/U as follows:

Control	Position
SPKR-ON-OFF switch	ON
VOLUME-OFF switch	OFF
FREQ 1-2 switch	1 or 2 depending on frequency desired.
SQUELCH-OFF control	OFF

b. Starting. Move the VOLUME control to the third position clockwise. The POWER pilot light will light and a signal or noise will be heard from the handset or speaker within 15 or 20 seconds. If noise is not heard or the POWER indicator does not light, refer to the performance checklist, paragraph 58 and determine the reason. When indications are obtained that the receiver is in working order, further operation can be accomplished.

35. Push-To-Talk Operation

a. For push-to-talk operation, it is only necessary to depress the push-to-talk switch on Handset H-33/PT, and speak into the handset microphone. When the push-to-talk switch is released, the transmitter is automatically turned off and the receiver is allowed to function. The volume to the handset and speaker can be regulated by setting the VOLUME switch to a position between OFF and full. The speaker is on at all times unless the SPKR switch is held in the OFF position. The operation of the handset is the same as that of a conventional telephone except for the use of the switch for transmission.

b. The transmission frequency can be changed a slight preset amount by placing the FREQ switch in the alternate position.

36. Squelch Operation

The receiver may be operated either with or without squelch control. When the SQUELCH-OFF control is in the OFF position, the receiver operates at all times. When the control is turned counterclockwise, it opens a switch and allows the SQUELCH threshold to be varied. The effect the squelch circuit has upon the receiver is to quiet or mute the audio output from the speaker or handset when no signal is being received so that receiver noise will not be heard. When the signal is picked up by the receiver the squelch operates to allow signals to come from the speaker or handset. The SQUELCH-OFF control permits adjustment for various signal and noise levels. Turning the control counterclockwise decreases the noise. The control is adjusted as follows:

a. Turn the SQUELCH control to its fully clockwise (OFF) position and note whether a signal or just noise is being received.

b. Wait until no signal is heard, then advance the SQUELCH control counterclockwise until the background noise just disappears. Wait for a signal to come on. The signal should be ordered, if possible, from a station at a distance of several miles from the receiver at a frequency to which the receiver is tuned.

c. The signal should unsquelch the receiver during the period of transmission from the other station. The receiver should squelch as soon as no carrier is being received.

d. If the receiver will not squelch during the continued operation, the SQUELCH control may have to be advanced in a counterclockwise direction. When the noise level is high and the signal level low, it may be impossible to use squelch operation. Under these conditions, reception can be carried on with the SQUELCH-OFF control in the OFF position. The speaker and handset will then operate continuously during reception.

37. Retransmission Operation

It is possible to receive a signal at the receiver and retransmit that same signal on another frequency. To do this, the audio output of the receiver must be fed into the audio input of the transmitter. This is done by making a few jumper connections in Electrical Equipment Cabinet CY-938/U as described in paragraph 27. Relay K271 (not supplied with the radio set) also must be inserted into its compartment in the receiver, and a jumper connection between two terminals in the receiver must be changed as indicated in paragraph 27. After the connections have been made the starting procedure in paragraph 34 and the squelch adjustments in paragraph 36 should be followed. The receiver and transmitter will now operate only when a signal is being received. Since, during retransmission operation, the squelch circuit turns the transmitter on only when a signal is being received, the squelch circuit must be used or the transmitter will operate continuously. The speaker on Radio Set Control C-847/U will monitor the receiver audio output. If break in with the handset is not desired, it should be disconnected from the radio set control.

Section IV. OPERATION UNDER UNUSUAL CONDITIONS

38. General

The operation of Radio Set AN/VRC-19(*) may be difficult in regions where extreme cold, heat, humidity and moisture, sand conditions, etc., prevail. In the following paragraphs, instructions are given on procedures for minimizing the effect of these unusual operation conditions.

39. Operation in Arctic Climates

Subzero temperatures and climatic conditions associated with cold weather affect the efficient operation of the equipment. Instructions and precautions for operation under such adverse conditions follow:

a. Handle the equipment carefully.

b. Keep the equipment warm and dry if possible.

c. Always take precaution to prevent cold air from coming into contact with heated tubes. A sudden draft of cold air is often sufficient to shatter the glass envelope of a heated tube.

d. Heavy coatings of frost will gather on mouth-type microphones in extreme cold weather when the handset is used in the open air. The operator's breath will cause frost to form in the small holes of the cap, which will affect transmitter modulation. Rubber and fabric diaphragms have been designed to protect some types of handsets; use them when available. Have a spare handset ready, if possible, in case the one in use fails to function properly when the above conditions prevail.

40. Operation in Tropical Climates

When operating equipment in tropical climates, high humidity will cause condensation of moisture on the equipment whenever the temperature of the equipment becomes lower than the ambient air. Dry the equipment thoroughly before operating it.

41. Operation in Desert Climates

a. Conditions similar to those encountered in tropical climates often prevail in desert areas. Use the same measures to insure proper operation of the equipment.

b. The main problem which arises with equipment operation in desert areas is the large amount of sand or dust which enters the moving parts of radio equipment, such as motors and power units. Be careful to keep the equipment as free from dust as possible. Make frequent preventive maintenance checks. Pay particular attention to the condition of the lubrication of the equipment. Excessive amounts of dust, sand, or dirt that come into contact with oil and grease result in grit, which will damage the equipment.

Section V. PRESETTING OR INITIAL ADJUSTMENT OF EQUIPMENT

42. General

a. Normally Radio Set AN/VRC-19(*) operates at a frequency which is initially set up at the time of installation. It is possible to change both the receiver and transmitting frequencies as desired if they are kept within a range of 152 to 174 mc. Two frequencies are provided in the transmitter, however, they must always be within .5 mc of each other. Therefore, if one frequency is changed and that maximum separation is exceeded, the other frequency must be changed also. This is necessary because the transmitter would not operate efficiently with too wide a separation of oscillator frequencies. There are three ways of accomplishing the changes in frequency and each requires a different amount of skill. These methods are:

(1) Replace both the receiver and transmitter with units which are tuned to the new frequency.

(2) Replace the receiver R-F Amplifier 152-174 mc and Local OSC 152-174 mc plug-in units and the transmitter with units preset to the new frequencies.

(3) Retune the above plug-in units and also the transmitter to the new frequencies.

b. The first two methods are not complicated and can be done by an operator without extensive radio experience. The last method requires precise adjustment and should only be done by a radio repairman with knowledge of the techniques used in performing alinement of the receiver and transmitter. In the paragraphs that follow, the procedures are described, however, more details can be found on these procedures by referring to the instruction book covering the specific units to be adjusted.

c. The transmitter can be adjusted to a new frequency (or frequencies) with reasonable accuracy providing that the oscillator circuit is not disturbed or altered. Alternation or disturbing of the oscillator circuit refers to changing the oscillator tube, or moving leads or adjustments used in the frequency setting procedure. If the above conditions can not be maintained, complete transmitter alinement should be made. For this information it is necessary to refer to the transmitter instruction book. When changing the transmitter frequencies caution should be used in making the adjustment and handling the unit so that complete alinement is not necessary. In most cases only a slight movement of the adjustment is enough to obtain the desired results. Do not turn the adjustments hazardly because this may throw the transmitter completely out of alinement.

d. Changing the receiver frequency is somewhat more difficult than for the transmitter in that the end result of tuning must allow the receiver to exactly tune to a transmitter which may be a considerable distance away. Normally an accurately cali-

brated signal generator is used to provide a signal simulating that of the distant transmitter. This provides a rough adjustment so that the receiver can be tuned to the approximate frequency. After the coarse tuning procedure is completed, it is necessary to warp the receiver first high frequency oscillator crystal to the transmitter frequency. This assures that the receiver is exactly tuned to the desired transmitter frequency. Without the "warping" of the oscillator, reduced range of reception and distortion in the audio output may result.

e. It is necessary in the adjustment of either the transmitter or receiver to remove these components from Electrical Equipment Cabinet CY-938/VRC. Connection to the circuit is made by means of a patch cord, which is available as an issued item at the maintenance depot. Normally, just one component is adjusted at a time. The two plug-in assemblies which are adjusted in the receiver must be removed and the shield pulled away from each of the units in order to allow access to the tuning adjustments. Reinsert the plug-in units into the receiver base assembly before starting the frequency changing procedure.

f. A VTVM (vacuum-tube voltmeter) and signal generator are required for changing the receiver frequency; a VTVM and frequency meter are required for changing the frequency of the transmitter. The signal generator and frequency meter must be capable of operating within the frequency range of 152-174 mc. Use the following test equipment and associated publications:

Test Equipment	Publication
VTVM:	
Electronic Multimeter TS-505/U or equal	TM 11-5511.
Signal Generators:	
Signal Generator, Boonton Radio Corporation, Model 202B or equal	Commercial Instruction Book
Signal Generator SG-3 or equal (when available)	TM 11-1258 (when available
Frequency Meter:	
Frequency Meter TS-174B/U or equal	TM 11-5044

43. Changing the Transmitter Frequency

a. Preliminary Procedure. Before proceeding with the frequency changing procedure, the following preliminary steps should be taken.

(1) Release the transmitter from Electrical Equipment Cabinet CY-938/VRC by turning the hold-in lock counterclockwise. The transmitter may then be pulled out of the cabinet by use of the handle located on the front panel.

(2) Remove right and left side dust covers from transmitter and check that all tubes are in place (fig. 33).

(3) A patch cord is required to complete system connections when the transmitter is removed from Electrical Equipment Cabinet CY-938/VRC. This cord is described in paragraph 45. Connect the patch cord from jack J801 in Electrical Equipment Cabinet CY-938/VRC to plug P401 on rear of transmitter. Connect the antenna.

(4) Determine the correct crystal frequency. Bear in mind that the two preset operating frequencies of the transmitter may not differ by more than 500 kc. After selecting two operating frequencies which meet this requirement, choose the correct crystal frequency by means of the following formula:

$$\text{crystal frequency} = \frac{\text{operating frequency}}{32}$$

Example:

F_1 = desired operating frequency = 162 mc.

F_2 = alternative operating frequency = 162 ±.5 mc = 161.5 or 162.5 mc.

F_c = crystal fundamental frequency.

$$F_c = \frac{F1}{32} = \frac{162000}{32} \text{ kc} = 5062.500 \text{ kc.}$$

$$F_c = \frac{F2}{32} = \frac{161500}{32} \text{ kc} = 5046.875 \text{ kc.}$$

To maintain accuracy of the operating frequency, carry division out to three places to the right of the decimal point. The above example used the maximum allowable frequency difference between the two operating frequencies. Actually, more efficient transmitter operation is attained when the two frequencies are closer together.

(5) Install the required crystals. To do this, first unplug the entire crystal oven assembly HR401 (fig. 33). Next, remove the three screws securing the cover of the crystal oven to the socket, unplug the heater and thermostat element from the socket, and then insert the correct crystals into the socket base. Re-assemble in the reverse order.

(6) Turn the VOLUME-OFF switch on Radio Set Control C-847/U clockwise to apply power to the heating element of the crystal

oven. At least 15 minutes heating time should be allowed, before performing the steps starting at b (2) below, in order to attain a stable crystal temperature.

(7) Turn the Freq 1-2 switch on Radio Set Control C-847/U to either the 1 or 2 position to apply filament power to the desired oscillator.

(8) Turn the COUPLING MAX-MIN control on the transmitter to the MIN position.

(9) Place the TUNE-OPR switch on the transmitter to the TUNE position.

(10) Set capacitors C403 and C404 on the transmitter chassis (fig. 26) to their mechanical midpoint.

b. Tuning. The VTVM and frequency meter are used during tuning of the transmitter. The VTVM is used to measure d-c voltage as the various stages are alined; the frequency meter is used for setting the transmitter to the correct frequency.

Caution: During transmitter alinement, do not operate the transmitter for more than three minutes at a time. Allow twelve minutes between operation cycles. This will prevent overheating of the transmitter power supply dynamotor.

(1) Set final plate capacitor C448 located directly above the power amplifier tubes (see fig. 26), to the position indicated in the following chart. Setting the capacitor to the indicated number of turns tunes the plate tank circuit of the power amplifier to approximately resonance. The locknut on the capacitor must first be loosened. Before proceeding, turn the capacitor clockwise until its plates touch, then back off the number of turns indicated.

FINAL PLATE CAPACITOR (C448) SETTING CHART

Operating frequency (mc)	Capacitor setting (in turns)
152-158	1
158-162	1-1/2
162-166	2
166-170	3
170-174	10

(2) Turn the TEST-OFF switch on the transmitter to the TEST position to apply power to the transmitter. Refer to step a (6) above.

(3) With the common terminal of the VTVM grounded to the chassis and the selector switch set to read negative d-c voltage, place the test probe in jack J401 (transmitter). See figures 23 and 26 for location of this jack and all the following test points and tuning controls. Adjust the phase modulator plate load impedance Z401 for maximum voltage. Note this voltage, then detune Z401 in a clockwise direction until the voltage at jack J401 is reduced to two-thirds the maximum noted above. Nominal voltage is -3.5 volts d-c.

(4) Place test probe in jack J402 and adjust the first doubler plate load impedance Z402 for maximum indication on the VTVM. Nominal voltage is -22 volts d-c.

(5) Place test probe in jack J403 and adjust the second doubler plate load impedance Z403 for maximum indication on the VTVM. Nominal voltage is -28 volts d-c.

(6) Place test probe in jack J404 and adjust the third doubler plate load impedance Z404 for maximum indication on the VTVM. Nominal voltage is -75 volts d-c.

(7) Place the test probe in the DRIVER GRID test jack J405. Set the tuning slug of the fourth doubler plate load impedance Z405 at approximately the same physical position as the other tuning slugs (Z401, Z402, Z403, Z404). Adjust the DRIVER GRID TUNE capacitor (C429) for maximum indication on the VTVM. Adjust Z405 for maximum indication on the VTVM. Some interaction between Z405 and C429 may be present, so that slight readjustment between the two may be necessary to obtain maximum indication on the VTVM. Nominal voltage at this stage is -55 volts d-c.

(8) Place the test probe in FINAL GRID jack J406 and adjust FINAL GRID TUNE 1 capacitor C439, FINAL GRID TUNE 2 capacitor C437, and DRIVER PLATE TUNE capacitor C436 for maximum indication on the VTVM. Nominal voltage is -57 volts d-c.

Note: FINAL GRID TUNE capacitors should be adjusted to approximately equal capacity, by keeping the shaft slots parallel.

(9) Turn the TEST-OFF switch to the OFF position.

Caution: HIGH D-C VOLTAGE IS PRESENT ON THE BAL AND PL CUR. TEST JACKS USED IN THE FOLLOWING STEPS.

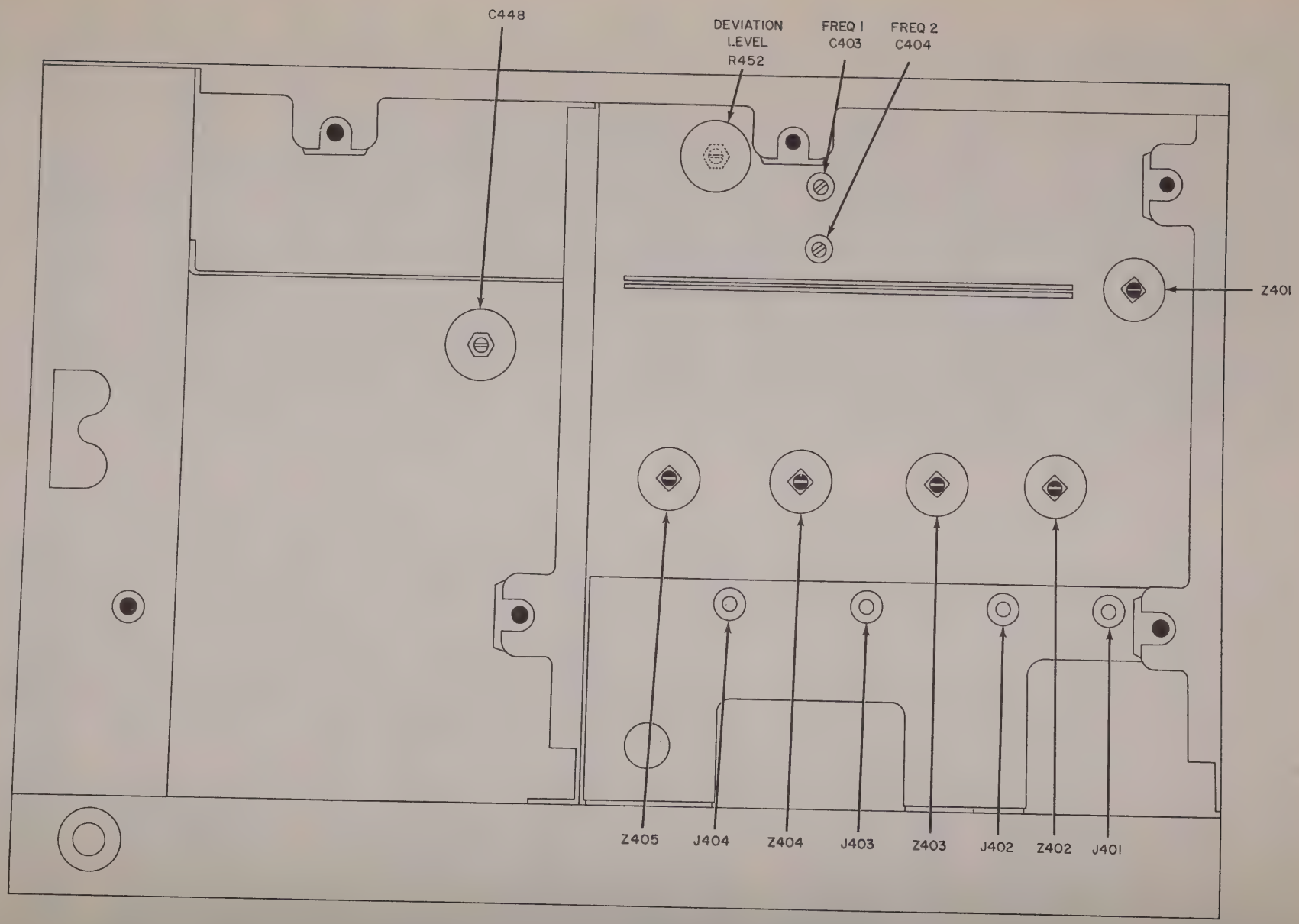


Figure 26. Right side of Radio Transmitter T-278/U showing alinement points.

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(10) Connect a VTVM across the PL CUR. test jacks J409 and J410, observing proper polarity. Set voltmeter selector switch to read approximately 2.5 volts d-c. The meter, so connected, will read 100 ma current per volt indicated.

(11) Set the FINAL PLATE TUNE control at the physical center of its range.

(12) Turn the TEST-OFF switch to the TEST position.

(13) Adjust the final plate capacitor C448 for minimum indication on the voltmeter.

(14) Turn the TEST-OFF switch to the OFF position and tighten the lock nut on capacitor C448.

(15) Turn the TEST-OFF switch to the TEST position.

(16) Adjust the FINAL PLATE TUNE control for minimum indication on the voltmeter.

(17) Adjust the ANT. TUNE capacitor for maximum voltmeter indication. If no voltage rise is noted, increase the COUPLING MAX-MIN control by turning toward MAX and repeat adjustment of the ANT. TUNE control.

(18) Turn the TUNE-OPR switch to OPR and observe voltmeter reading. Adjust the COUPLING MAX-MIN control toward MAX until 100 ma of plate current is indicated (1 volt d-c on meter).

(19) Readjust the FINAL PLATE TUNE control for minimum indication on the voltmeter.

(20) Readjust the ANT. TUNE control for a maximum indication on voltmeter.

(21) Repeat steps 19 and 20 as necessary to satisfy both conditions. Do not change either the FINAL PLATE TUNE or ANT. TUNE controls after completing this adjustment.

(22) Increase the COUPLING MAX-MIN control toward MAX until the voltmeter indicates 1.4 volts d-c which corresponds to 140 ma.

(23) Turn the TEST-OFF switch to the OFF position.

(24) Disconnect the voltmeter from PL CUR. jacks and connect it across the BAL jacks J407 and J408.

(25) Turn the TEST-OFF switch to the TEST position. If plate current of the power amplifier tubes is balanced, the voltmeter across the BAL jacks will read zero. If a deflection is noted at the BAL jacks, turn the FINAL GRID TUNE 1 control in a direction to reduce the deflection. Turn the FINAL GRID TUNE 2 control in opposite direction to bring grid circuit back to resonance, as indicated by maximum voltage on the VTVM at the FINAL GRID test jack. Repeat adjustment of the FINAL GRID TUNE 1 control as necessary to obtain balance.

(26) Turn the TEST-OFF switch to the OFF position and connect the voltmeter test leads to the PL CUR. jacks.

(27) Turn the TEST-OFF switch to the TEST position and observe voltmeter indication. If necessary, readjust the COUPLING MAX-MIN control to obtain a reading of 1.4 volts. This is proportional to 140 ma of plate current and represents the proper loading for Radio Transmitter T-278/U.

(28) Check the transmitter output frequencies by placing a wire connected to the output terminal of a frequency meter near the antenna circuit (see instructions packed with frequency meter).

(29) If frequency one or frequency two is incorrect, adjust capacitors C403 or C404 on the transmitter chassis (fig. 26) until the correct frequency is indicated on the frequency meter. C403 and C404 vary the frequency of the frequency one and frequency two oscillators respectively. The transmitter is now completely tuned.

(30) Turn the TEST-OFF switch to the OFF position.

(31) Disconnect meters, reassemble dust covers, and install the transmitter in Electrical Equipment Cabinet CY-938/VRC.

44. Changing the Receiver Frequency

a. Preliminary Procedures before Changing the Receiver Frequency. The following preliminary steps should be taken:

(1) Release the receiver from Electrical Equipment Cabinet CY-938/VRC by turning the hold-in lock counterclockwise, the receiver may then be pulled out of the cabinet by use of a handle located on the front panel.

(2) Remove the top cover and the two plug-in assemblies marked LOCAL OSC 152-174 MC and R-F AMPL 152-174 MC.

(3) Remove the plug-in unit shields to allow access to the test points and adjustments and reinsert the plug-in units into the receiver.

(4) A patch cord is required to complete the connections from the receiver to the Electrical Equipment Cabinet CY-938/VRC. Connect the patch cord from jack J803 in the cabinet to plug P252 in the rear of the receiver.

(5) Determine the frequency to which the receiver is to be tuned. This will allow you to calculate the proper crystal frequency which is to be used at the high frequency oscillator (subpar. b below).

(6) Refer to figure 27 for location of the correct plug-in assembly and to figure 28 for location of the adjustments.

b. Local Oscillator 152-174 MC Plug-In Unit Alinement Procedure. When a new operating frequency is to be used, the h-f oscillator V31, tripler V32, and doubler V33 contained in the plug-in unit must be retuned. The procedure consists of a rough adjustment which makes certain the oscillator is operating near the desired frequency and a precise adjustment which tunes the receiver exactly to the desired signal frequency. A VTVM is connected to the front panel test points during the procedure to give tuning indications. It is important that the proper crystal is inserted in the crystal oven, otherwise it may be impossible to tune the oscillator to the desired frequency. Crystal Y51 should be selected by the following formula: $\text{XTAL FREQ} = \frac{\text{FS} - 7.8}{6}$ where XTAL FREQ is the frequency of the crystal which is to be found and FS is the desired signal frequency in megacycles. After the correct crystal has been selected, remove crystal oven E 31 (fig. 34) and insert the new crystal, using the same procedure indicated for disassembly of the transmitter crystal oven (par. 43a (5). The adjustment locations can be found in figure 28. Use the following sequence of adjustments:

VTVM Connection	Adjustment	Indication
None	*Z31 unscrewed almost all the way counterclockwise.	None
Terminal on TB31 to which R40 connects (first term. from front of local osc. chassis) and GND test point (front of receiver).	Z31	Maximum negative voltage.
Terminal on TB31 to which R34 connects (fourth term. from front of local osc. chassis) and GND test point (front of receiver).	Z32 and Z33	Maximum negative voltage.
LO and GND test points (front of receiver).	Z34	Maximum negative voltage.

Note: *Z31 will have to be readjusted slightly, later in the procedure.

c. R-F AMPL 152-174 MC Plug-In Unit Alinement Procedure. The r-f stages, V1 and V2, and the mixer stage V3, contained in the plug-in unit, must be alined to the new signal frequency. A VTVM is used at the test points located on the front panel of the receiver for the tuning indications. The signal to which the stages are tuned is provided by a signal generator (par. 42f). Connect the signal generator to the antenna coaxial connector and set it to the desired signal frequency (unmodulated). Connect the VTVM between the 2ND IF and GND test points on the front of the receiver, and adjust Z1 through

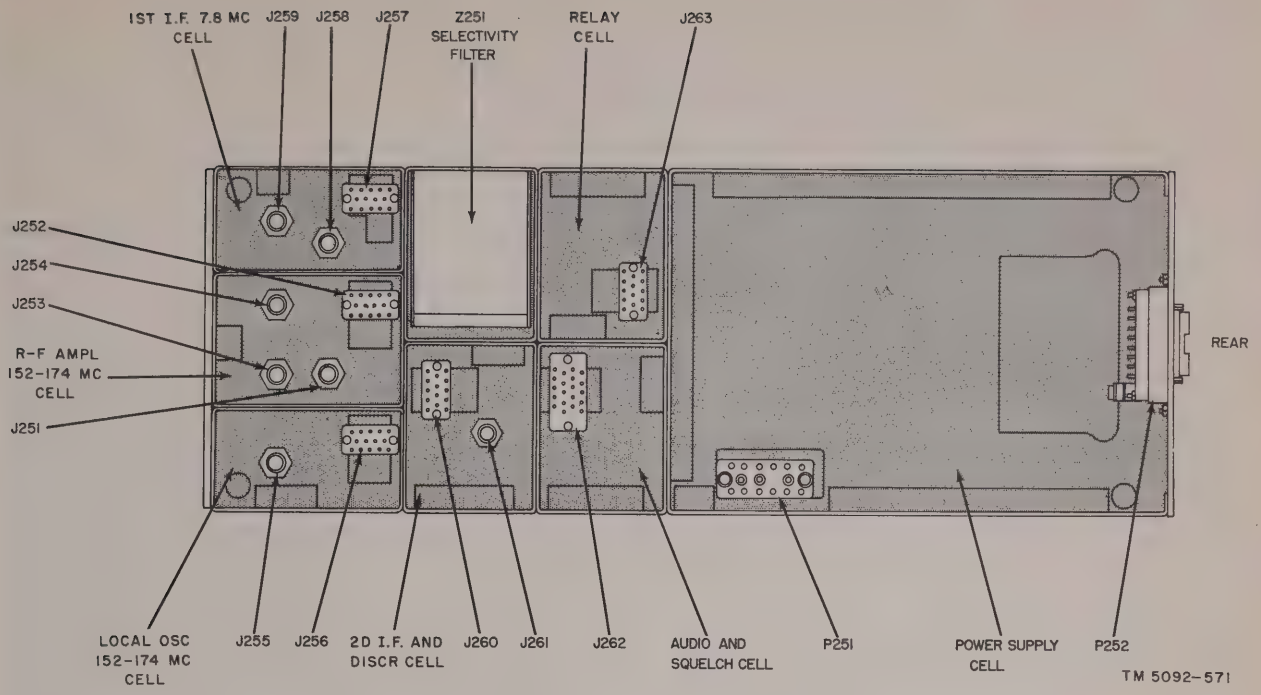


Figure 27. Radio Receiver R-394/U compartment location.

Z5, in sequence, for maximum negative voltage. Repeat the above adjustments at least three times, in sequence. Keep the signal generator output as low as possible, consistent with a usable meter indication.

d. Adjusting Receiver to Transmitter Frequency. As was explained before, it is usually not possible to aline the receiver exactly to the distant transmitter frequency by the use of a signal generator, therefore a slight adjustment of the high frequency crystal oscillator will be necessary to aline the receiver with a signal from the distant transmitter. The procedure is as follows:

(1) Place the receiver in operation as described in paragraphs 34 and 36. Make sure that the transmitter is operating on the desired signal frequency, and is transmitting. The radio set must be connected to an antenna for this adjustment.

(2) Connect a VTVM to the receiver front panel test points marked DISCR and GND.

(3) Readjust oscillator warping coil Z31 for a zero reading on the VTVM.

(4) The receiver is now completely adjusted to the new operating frequency and the plug-in unit shields and plug-in units may be reinstalled in the receiver base assembly. The receiver can then be replaced in Electrical Equipment Cabinet CY-938/VRC.

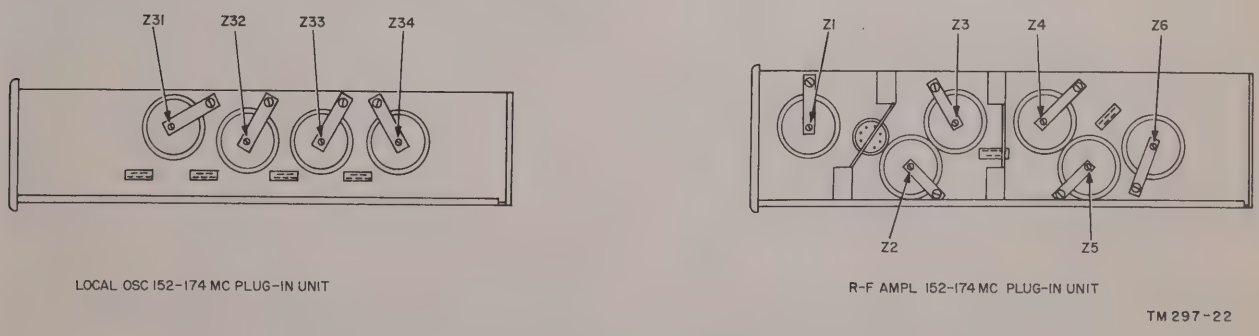


Figure 28. Radio Receiver R-394/U R-F amplifier and local oscillator 152-174 MC Plug-In Units, alinement points.

CHAPTER 3

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. PREVENTIVE MAINTENANCE SERVICES

45. Tools

Only alinement tools are supplied with Radio Set AN/VRC-19(*). The tools found in the Tools Equipment TE-41 are adequate for repair of the set. A special patch cord (Special Purpose Electrical Cable Assembly CX-2371/U) is available to connect the receiver, transmitter, or power supply to Electrical Equipment Cabinet CY-938/VRC when it is necessary to operate them outside the cabinet. The patch cord is 30 inches long overall and has a male connector on one end and a female connector on the other end. It is very useful in trouble shooting, repair, or adjustment procedures because once the component is out of Electrical Equipment Cabinet CY-938/VRC internal measurements and adjustments of the components can be made while the radio set is in operation. The cord can be used with any of the three units due to the identical pin arrangement of their rear panel connectors. The cord is not supplied with the radio set but must be requisitioned through regular supply channels. An illustration of the patch cord is shown in figure 29.

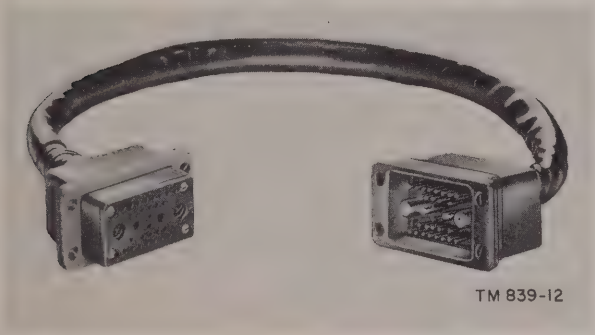


Figure 29. Special Purpose Electrical Cable Assembly CX-2371/U (patch cord).

46. Definition of Preventive Maintenance

Preventive maintenance is work performed on equipment (usually when the equipment is not in use) to keep it in good working order so that breakdowns and needless interruptions in service will be kept to a minimum. Preventive maintenance differs from trouble shooting and repair since its object is to prevent certain troubles from occurring. See AR 750-5.

47. General Preventive Maintenance Techniques

a. Use #000 sandpaper to remove corrosion.

b. Use a clean, dry lint-free cloth or a dry brush for cleaning.

(1) If necessary, except for electrical contacts, moisten the cloth or brush with Solvent, Dry Cleaning (SD); then wipe the parts with a cloth.

(2) Clean electrical contacts with a cloth moistened with carbon tetrachloride; then wipe them dry with a cloth.

Caution: Repeated contact of carbon tetrachloride with the skin or prolonged breathing of the fumes is dangerous. Make sure adequate ventilation is provided.

c. If available, dry compressed air may be used at a line pressure not exceeding 60 pounds per square inch to remove dust from inaccessible places; be careful however, or mechanical damage from the air blast may result.

d. For further information on preventive maintenance techniques, refer to TB SIG 178.

48. Use of Preventive Maintenance Forms (figs. 30 and 31)

The decision as to which items on DA AGO Forms 11-238 and 11-239 are applicable to this equipment is to be made in the case of first echelon maintenance by the communication officer/chief or his designated representative, and in the case of second and third echelon maintenance, by the individual making the inspection. Instructions for the use of each form appear on the reverse side of the form.

49. Performing Exterior Preventive Maintenance

Caution: Tighten screws, bolts, and nuts carefully. Fittings tightened beyond the pressure for

OPERATOR FIRST ECHELON MAINTENANCE CHECK LIST FOR SIGNAL CORPS EQUIPMENT

RADIO COMMUNICATION, DIRECTION FINDING, CARRIER, RADAR

INSTRUCTIONS: See other side

EQUIPMENT NOMENCLATURE	EQUIPMENT SERIAL NO.

LEGEND FOR MARKING CONDITIONS: ✓ Satisfactory; X Adjustment, repair or replacement required; (X) Defect corrected.
NOTE: Strike out items not applicable.

DAILY

NO.	ITEM	CONDITION S	M	T	W	T	F	S
1	COMPLETENESS AND GENERAL CONDITION OF EQUIPMENT *(receiver, transmitter, carrying cases, wire and cable, microphones, tubes, spare parts, technical manuals and accessories).* PAR.49a							
2	LOCATION AND INSTALLATION SUITABLE FOR NORMAL OPERATION. PAR.49b							
3	CLEAN DIRT AND MOISTURE FROM ANTENNA, MICROPHONE, HEADSETS, CHESTSETS, KEYS, JACKS, PLUGS, TELEPHONES, CARRYING BAGS, COMPONENT PANELS. PAR.49c							
4	INSPECT SEATING OF READILY ACCESSIBLE "PLUCK-OUT" ITEMS: TUBES, LAMPS, CRYSTALS, FUSES, CONNECTORS, VIBRATORS, PLUG-IN COILS AND RESISTORS.							
5	INSPECT CONTROLS FOR BINDING, SCRAPING, EXCESSIVE LOOSENESS, WORN OR CHIPPED GEARS, MISALIGNMENT, POSITIVE ACTION. PAR.49d							
6	CHECK FOR NORMAL OPERATION. PAR.49e							

WEEKLY

NO.	ITEM	CONDITION	NO.	ITEM	CONDITION
7	CLEAN AND TIGHTEN EXTERIOR OF COMPONENTS AND CASES, RACK MOUNTS, SHOCK MOUNTS, ANTENNA MOUNTS, COAXIAL TRANSMISSION LINES, WAVE GUIDES, AND CABLE CONNECTIONS. PAR. 49f		13	INSPECT STORAGE BATTERIES FOR DIRT, LOOSE TERMINALS, ELECTROLYTE LEVEL AND SPECIFIC GRAVITY, AND DAMAGED CASES.	
8	INSPECT CASES, MOUNTINGS, ANTENNAS, TOWERS, AND EXPOSED METAL SURFACES, FOR RUST, CORROSION, AND MOISTURE. PAR. 49g		14	CLEAN AIR FILTERS, BRASS NAME PLATES, DIAL AND METER WINDOWS, JEWEL ASSEMBLIES.	
9	INSPECT CORD, CABLE, WIRE, AND SHOCK MOUNTS FOR CUTS, BREAKS, FRAYING, DETERIORATION, KINKS, AND STRAIN. PAR. 49h		15	INSPECT METERS FOR DAMAGED GLASS AND CASES.	
10	INSPECT ANTENNA FOR ECCENTRICITIES, CORROSION, LOOSE FIT, DAMAGED INSULATORS AND REFLECTORS. PAR.i		16	INSPECT SHELTERS AND COVERS FOR ADEQUACY OF WEATHERPROOFING. PAR. 49k	
11	INSPECT CANVAS ITEMS, LEATHER, AND CABLING FOR MILDEW, TEARS, AND FRAYING.		17	CHECK ANTENNA GUY WIRES FOR LOOSENESS AND PROPER TENSION.	
12	INSPECT FOR LOOSENESS OF ACCESSIBLE ITEMS: SWITCHES, KNOBS, JACKS, CONNECTORS, ELECTRICAL TRANSFORMERS, POWERSTATS, RELAYS, SELSYNS, MOTORS, BLOWERS, CAPACITORS, GENERATORS, AND PILOT LIGHT ASSEMBLIES. PAR. 49j		18	CHECK TERMINAL BOX COVERS FOR CRACKS, LEAKS, DAMAGED GASKETS, DIRT AND GREASE. PAR. 49l	

19 IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION.

DA AGO FORM 1 MAY 51 11-238 REPLACES DA AGO FORM 419, 1 DEC 50, WHICH IS OBSOLETE.

TM 297-23

Figure 30. DA AGO Form 11-238.

SECOND AND THIRD ECHELON MAINTENANCE CHECK LIST FOR SIGNAL CORPS EQUIPMENT
RADIO COMMUNICATION, DIRECTION FINDING, CARRIER, RADAR

INSTRUCTIONS: See other side

EQUIPMENT NOMENCLATURE | EQUIPMENT SERIAL NO.

LEGEND FOR MARKING CONDITIONS: ✓ Satisfactory; X Adjustment, repair or replacement required; (X) Defect corrected.
NOTE: Strike out items not applicable.

NO.	ITEM	CONDITION
1	COMPLETENESS AND GENERAL CONDITION OF EQUIPMENT *(receiver, transmitter, carrying cases, wire and cable, microphones, tubes, spare parts, technical manuals and accessories).* PAR. 49 a	
2	LOCATION AND INSTALLATION SUITABLE FOR NORMAL OPERATION. PAR. 49 b	
3	CLEAN DIRT AND MOISTURE FROM ANTENNA, MICROPHONE, HEADSETS, CHESTSETS, KEYS, JACKS, PLUGS, TELEPHONES, CARRYING BAGS, COMPONENT PANELS. PAR. 49 c	
4	INSPECT SEATING OF READILY ACCESSIBLE "PLUCK-OUT" ITEMS: TUBES, LAMPS, CRYSTALS, FUSES, CONNECTORS, VIBRATORS, PLUG-IN COILS AND RESISTORS.	
5	INSPECT CONTROLS FOR BINDING, SCRAPING, EXCESSIVE LOOSENESS, WORN OR CHIPPED GEARS, MISALIGNMENT, POSITIVE ACTION. PAR. 49 d	
6	CHECK FOR NORMAL OPERATION. PAR. 49 e	
7	CLEAN AND TIGHTEN EXTERIOR OF COMPONENTS AND CASES, RACK MOUNTS, SHOCK MOUNTS, ANTENNA MOUNTS, COAXIAL TRANSMISSION LINES, WAVE GUIDES, AND CABLE CONNECTIONS. PAR. 49 f	
8	INSPECT CASES, MOUNTINGS, ANTENNAS, TOWERS, AND EXPOSED METAL SURFACES, FOR RUST, CORROSION, AND MOISTURE. PAR. 49 g	
9	INSPECT CORD, CABLE, WIRE, AND SHOCK MOUNTS FOR CUTS, BREAKS, FRAYING, DETERIORATION, KINKS, AND STRAIN. PAR. 49 h	
10	INSPECT ANTENNA FOR ECCENTRICITIES, CORROSION, LOOSE FIT, DAMAGED INSULATORS AND REFLECTORS. PAR. 49 i	
11	INSPECT CANVAS ITEMS, LEATHER, AND CABLING FOR MILDEW, TEARS, AND FRAYING.	
12	INSPECT FOR LOOSENESS OF ACCESSIBLE ITEMS: SWITCHES, KNOBS, JACKS, CONNECTORS, ELECTRICAL TRANSFORMERS, POWERSTATS, RELAYS, SELSYNS, MOTORS, BLOWERS, CAPACITORS, GENERATORS, AND PILOT LIGHT ASSEMBLIES. PAR. 49 j	
13	INSPECT STORAGE BATTERIES FOR DIRT, LOOSE TERMINALS, ELECTROLYTE LEVEL AND SPECIFIC GRAVITY, AND DAMAGED CASES.	
14	CLEAN AIR FILTERS, BRASS NAME PLATES, DIAL AND METER WINDOWS, JEWEL ASSEMBLIES.	
15	INSPECT METERS FOR DAMAGED GLASS AND CASES.	
16	INSPECT SHELTERS AND COVERS FOR ADEQUACY OF WEATHERPROOFING. PAR. 49 k	
17	CHECK ANTENNA GUY WIRES FOR LOOSENESS AND PROPER TENSION.	
18	CHECK TERMINAL BOX COVERS FOR CRACKS, LEAKS, DAMAGED GASKETS, DIRT AND GREASE. PAR. 49 l	

NO.	ITEM	CONDITION
19	ELECTRON TUBES - INSPECT FOR LOOSE ENVELOPES, CAP CONNECTORS, CRACKED SOCKETS: INSUFFICIENT SOCKET SPRING TENSION; CLEAN DUST AND DIRT CAREFULLY; CHECK EMISSION OF RECEIVER TYPE TUBES. PAR. 50 d	
20	INSPECT FILM CUT-OUTS FOR LOOSE PARTS, DIRT, MISALIGNMENT AND CORROSION.	
21	INSPECT FIXED CAPACITORS FOR LEAKS, BULGES, AND DISCOLORATION. PAR. 50 e	
22	INSPECT RELAY AND CIRCUIT BREAKER ASSEMBLIES FOR LOOSE MOUNTINGS; BURNED, PITTED, CORRODED CONTACTS; MISALIGNMENT OF CONTACTS AND SPRINGS; INSUFFICIENT SPRING TENSION; BINDING OF PLUNGERS AND HINGE PARTS.	
23	INSPECT VARIABLE CAPACITORS FOR DIRT, MOISTURE, MISALIGNMENT OF PLATES, AND LOOSE MOUNTINGS. PAR. 50 f	
24	INSPECT RESISTORS, BUSHINGS, AND INSULATORS, FOR CRACKS, CHIPPING, BLISTERING, DISCOLORATION AND MOISTURE. PAR. 50 g	
25	INSPECT TERMINALS OF LARGE FIXED CAPACITORS AND RESISTORS FOR CORROSION, DIRT AND LOOSE CONTACTS. PAR. 50 h	
26	CLEAN AND TIGHTEN SWITCHES, TERMINAL BLOCKS, BLOWERS, RELAY CASES, AND INTERIORS OF CHASSIS AND CABINETS NOT READILY ACCESSIBLE. PAR. 50 i	
27	INSPECT TERMINAL BLOCKS FOR LOOSE CONNECTIONS, CRACKS AND BREAKS. PAR. 50 j	
28	CHECK SETTINGS OF ADJUSTABLE RELAYS.	
29	LUBRICATE EQUIPMENT IN ACCORDANCE WITH APPLICABLE DEPARTMENT OF THE ARMY LUBRICATION ORDER.	
30	INSPECT GENERATORS, AMPLIDYNES, DYNAMOTORS, FOR BRUSH WEAR, SPRING TENSION, ARCING, AND FITTING OF COMMUTATOR. PAR. 50 k	
31	CLEAN AND TIGHTEN CONNECTIONS AND MOUNTINGS FOR TRANSFORMERS, CHOKES, POTENTIOMETERS, AND RHEOSTATS. PAR. 50 l	
32	INSPECT TRANSFORMERS, CHOKES, POTENTIOMETERS, AND RHEOSTATS FOR OVERHEATING AND OIL-LEAKAGE. PAR. 50 m	
33	BEFORE SHIPPING OR STORING - REMOVE BATTERIES.	
34	INSPECT CATHODE RAY TUBES FOR BURNT SCREEN SPOTS.	
35	INSPECT BATTERIES FOR SHORTS AND DEAD CELLS.	
36	INSPECT FOR LEAKING WATERPROOF GASKETS, WORN OR LOOSE PARTS. PAR. 50 n	
37	MOISTURE AND FUNGIPROOF. PAR. 50 p	

38 IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION.

DA AGO FORM 1 MAY 51 11-239 REPLACES DA AGO FORM 419, 1 DEC 50, WHICH IS OBSOLETE. 06—16—45929-1

TM 297-24

Figure 31. DA AGO Form 11-239.

which they are designed will become damaged or broken.

a. Check for completeness of equipment; receiver, transmitter, power supplies, control, cables, handset, and accessories (par. 10).

b. Check that the radio set components are properly placed and haven't shifted since installation.

c. Clean dirt and moisture from the antenna, handset, control and cabinet.

d. Check controls for binding, scraping, excessive looseness, misalignment, and positive action.

e. Check operation of radio set for satisfactory reception and transmission.

f. Check the cabinet brackets, rack, shock mounts control bracket, battery cable connections, and antenna cable connections, for looseness or defects.

g. Inspect the exterior of the cabinet, control, and mounts for signs of rust, corrosion, moisture, and chipped paint.

h. Inspect the cables for cuts, breaks, fraying, deterioration, kinks and strain.

i. Inspect the antenna for bent or otherwise damaged posts.

j. Inspect the pilot light jewels for dirt or cracked lens.

k. Inspect the covers of Electrical Equipment Cabinet CY-938/VRC and Radio Set Control C-847/U for adequacy of weatherproofing.

l. Inspect rubber gaskets at wire entrance holes in cabinet and control for deterioration or leaks.

50. Performing Interior Preventive Maintenance

To gain access to Electrical Equipment Cabinet CY-938/VRC, remove both covers by unfastening the trunk type latches. If the cabinet is mounted in the vertical position, it is necessary to remove the cabinet from the rack before taking off the rear cover. The radio set can be disabled by removing the receiver and then taking fuse F801 from its holder. With this fuse out there is no danger of getting a shock from the equipment.

a. Remove each component and check the tubes, fuses, vibrators, crystals, plug-in capacitors, and connectors for proper seating.

b. Inspect the cable lacing for mildew, tears and fraying.

c. Inspect the switches, knobs, jacks, transformers, chokes, dynamotor, filters, and relays for looseness.

d. Check all tubes, electron and regulator, for loose envelopes, cap connections, and insufficient socket tension. Clean dust and dirt carefully. Check emission of all tubes that can be tested.

e. Inspect fixed capacitors for leaks, bulges, and discoloration.

f. Check variable trimmer capacitors for dirt, moisture, misalignment of plates, and loose mountings.

g. Inspect resistors, bushings and insulators for cracks, chipping, blistering, discoloration and moisture.

h. Inspect large fixed capacitors and resistors for corrosion, dirt and loose contacts.

i. Clean and tighten loose switches, terminal blocks and interiors of chassis and cabinet not readily accessible.

j. Inspect terminal blocks for loose connections, cracks, and breaks.

k. Inspect the dynamotor for brush wear, spring tension, arcing, and pitting of the commutator.

l. Clean and tighten connections and mountings for transformers, chokes, potentiometers, and rheostats.

m. Inspect transformers, chokes, potentiometers and rheostats for overheating and leakage.

n. Inspect the gaskets inside the cabinet and control covers to make sure they are waterproof.

o. Check the loudspeaker for tears in the cone or a bent frame.

p. Check moisture and fungiproofing.

Section II. LUBRICATION AND WEATHERPROOFING

51. Lubrication

Lubrication is not required for Radio Set AN/VRC-19(*).

52. Weatherproofing

a. General. Signal Corps equipment, when operated under severe climatic conditions such as prevail in tropical, arctic, and desert regions, requires special treatment and maintenance. Fungus growth, insects, dust, corrosion, salt spray, excessive moisture, and extreme temperatures are harmful to most materials.

b. Tropical Maintenance. A special moistureproofing and fungiproofing treatment has been devised which, if properly applied, provides a reasonable degree of protection. This treatment is explained in TB SIG 13 and TB SIG 72.

c. Winter Maintenance. Special precautions necessary to prevent poor performance or total operational failure of equipment in extremely low temperatures are explained in TB SIG 66 and TB SIG 219.

d. Desert Maintenance. Special precautions necessary to prevent equipment failure in areas subject to extremely high temperatures, low humidity, and excessive sand and dust are explained in TB SIG 75.

53. Rustproofing and Painting

a. When the finish on the cabinet has been badly scarred or damaged, rust and corrosion can be prevented by touching up bare surfaces. Use #00 or #000 sandpaper to clean the surface down to the bare metal; obtain a bright smooth finish.

Caution: Do not use steel wool. Minute particles frequently enter the equipment cabinet and cause harmful internal shorting or grounding of circuits.

b. When a touch-up job is necessary, apply paint with a small brush. Remove rust from the cabinet by cleaning corroded metal with solvent (SD). In some cases it may be necessary to use solvent (SD) to soften the rust and to use sandpaper to complete the preparation for painting. Paint used will be authorized and consistent with existing regulations. Refer to TM 9-2851.

Section III. TROUBLE SHOOTING AT ORGANIZATIONAL MAINTENANCE LEVEL

54. Scope

a. The trouble shooting and repair work that can be performed at the organizational maintenance level (operators and repairmen) is necessarily limited in scope by the tools, test equipment, and replaceable parts issued, and by the existing situation. Accordingly, trouble shooting is based on the performance of the equipment and the use of the senses in determining such trouble as burned-out tubes, fuses, etc.

b. The following paragraphs in this section will help to determine which component is at fault. After localizing the fault to a component, the defective stage or item can be determined.

55. Visual Inspection

a. Failure of this equipment to operate properly usually will be caused by one or more of the following faults:

(1) Improperly connected battery cable.

(2) Worn, broken, or disconnected cords or plugs.

(3) Burned-out fuses.

(4) Relay contacts burned because of overloads.

(5) Wires broken because of excessive vibration.

(6) Defective tubes.

(7) Inactive (dirty or cracked) crystal.

b. When failure is encountered and the cause is not immediately apparent, check as many of the above items as is practicable before starting a detailed examination of the component parts of the system. If possible, obtain information from the operator of the equipment regarding performance at the time trouble occurred.

c. Visually inspect the antenna system for obvious abnormalities.

56. System Sectionalization of Trouble to Component

System sectionalization consists of determining whether the trouble is in the receiver, cabinet, transmitter, control, or the power supplies.

a. Operate the entire set and observe its performance. See the equipment performance checklist (par. 58) for normal operating indications.

b. If the entire radio set is inoperative, and the POWER indicator on the radio set control does not light, the trouble is probably in the primary power

source which extends through fuse F801 and wiring in the cabinet, through a fuse and wiring in the transmitter power supply, through the power switch in the radio set control, and back to the transmitter power supply (figs. 51, 52, and 53).

c. If only one component is inoperative first check for burned-out fuses. Do not continue to burn out fuses before checking further to determine the origin of the trouble.

d. If the signal is present in one component but there is no indication of a signal in the component which electrically follows or is associated with it, the trouble may be a defective or disconnected cord or connector.

e. To find the source of excessive noise in the receiver, remove the antenna cord from the operating receiver. If noise becomes less pronounced or stops, the trouble is caused by some source external to the receiver. If noise persists after the antenna is disconnected, the trouble is in the receiver or in one of the components associated with it.

f. By the use of procedures similar to the simple checks given above, the trouble often can be isolated to a particular unit.

g. If these checks are not productive, use the equipment performance checklist (par. 58) as explained in paragraph 57.

57. Trouble Shooting by using Equipment Performance Checklist

a. General. The equipment performance checklist (par. 58) will help the operator to locate trouble in the equipment. The chart gives the item to be checked, the conditions under which the item is checked, the normal indications and tolerances of correct operation, and the corrective measures the operator can take. When using this chart, follow the items in numerical sequence.

b. Action or Condition. For some items, the information given in the Action or condition column consists of various switch and control settings under which the item is to be checked. For other items, it represents an action that must be taken to check the normal indication given in the Normal indications column.

c. Normal Indications. The normal indications listed include the visible and audible signs that the operator should perceive when he checks the items. If the indications are not normal, the operator should apply the recommended corrective measures.

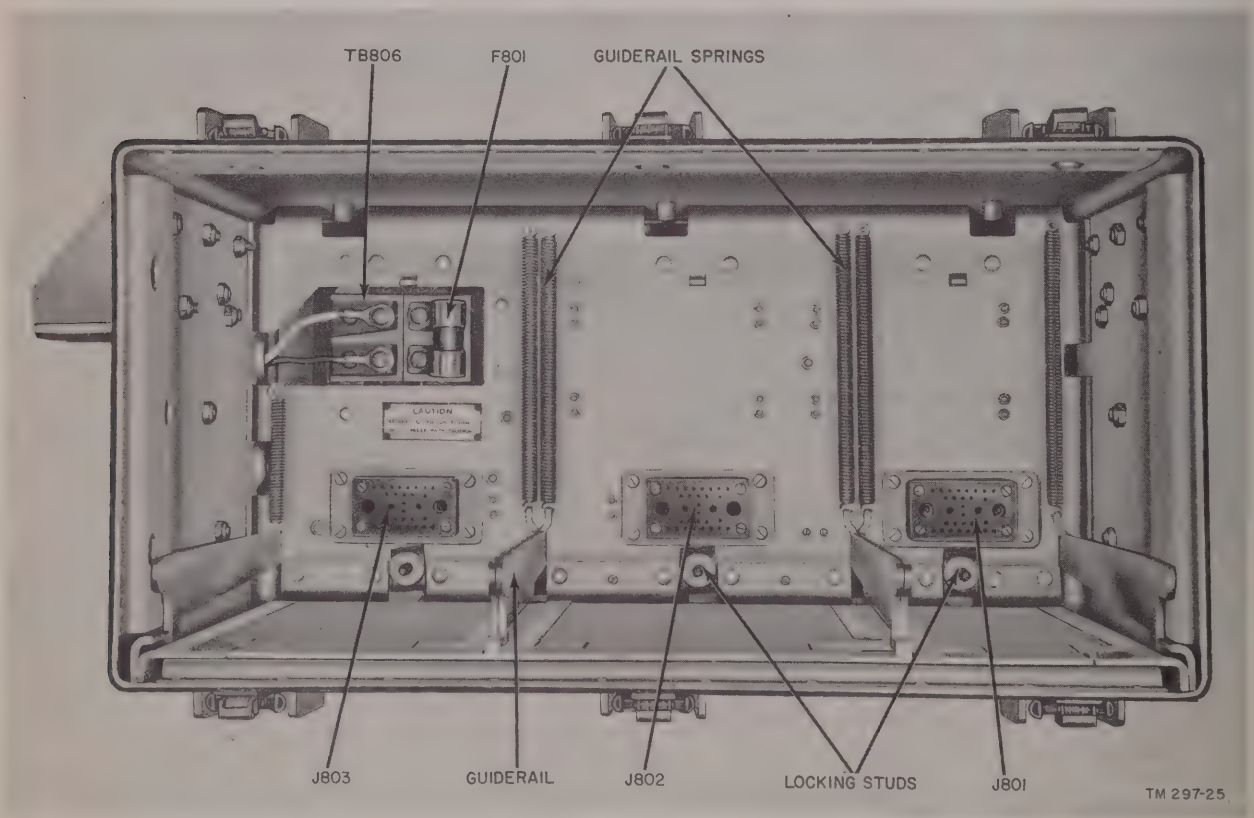


Figure 32. Interior view of Electrical Equipment Cabinet CY-938/VRC showing fuse location.

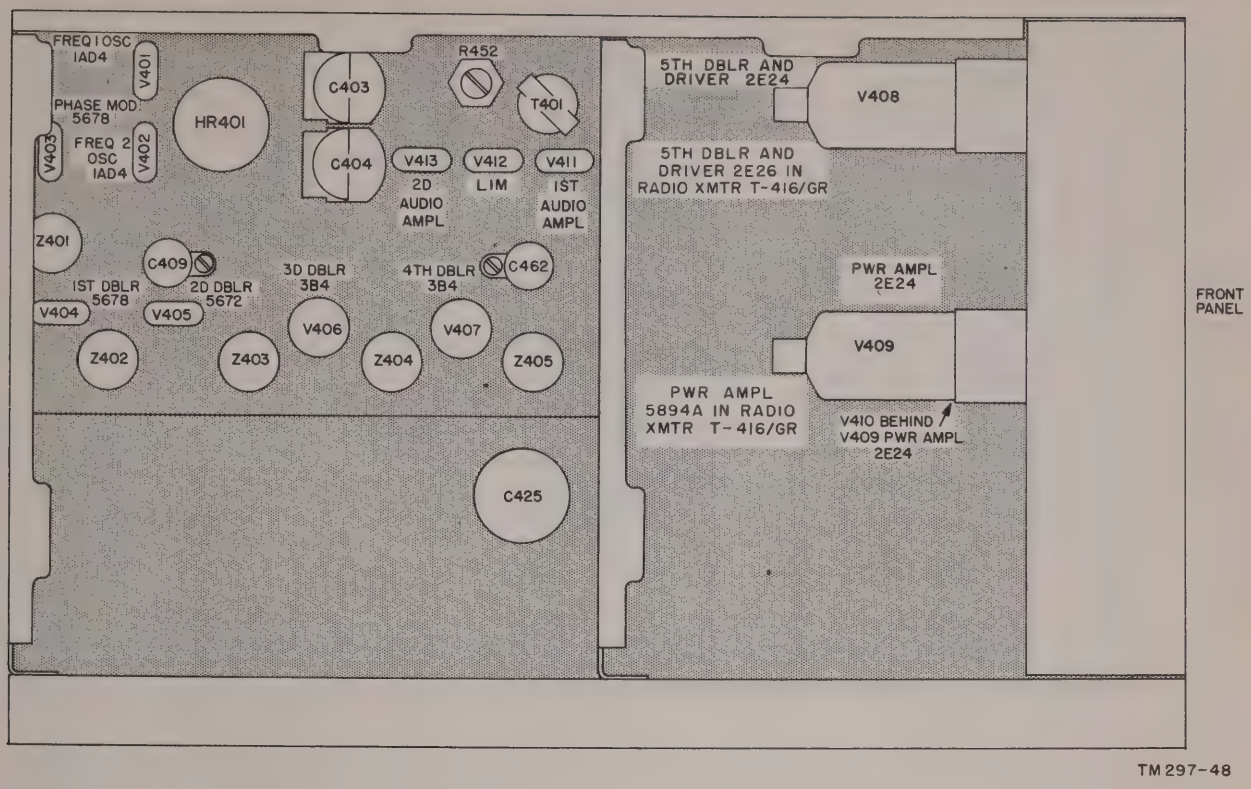


Figure 33. Radio Transmitter T-278/U tube location.

d. Corrective Measures. The corrective measures listed are those the operator can make without turning in the equipment for repairs. A reference in the checklists to a paragraph or technical manual indicates that the trouble probably cannot be corrected during operation and that trouble shooting by an experienced repairman is necessary. If the set is completely inoperative, or if the recommended corrective measures do not yield results, trouble shooting is necessary. However, if the tactical situation requires that communication be maintained and if the set is not completely inoperative, the operator must attempt to maintain the set in operation as long as it is possible to do so.

Note: Refer to figures 32 through 36 for the locations of fuses, tubes, and vibrators.

58. Equipment Performance Checklist

a. Preparatory Operations.

Item No.	Unit	Item	Action or condition	Normal indications	Corrective measures
1	Radio Transmitter T-278/U.	TEST-OFF switch.	Set to OFF.		
2		TUNE-OPR switch.	Set to OPR.		
3	Electrical Equipment Cabinet CY-938/VRC.	Battery cable.	Connected to TB806 and battery		
4		Antenna cable.	Connected to ANT connector on cabinet and to antenna base connector.		

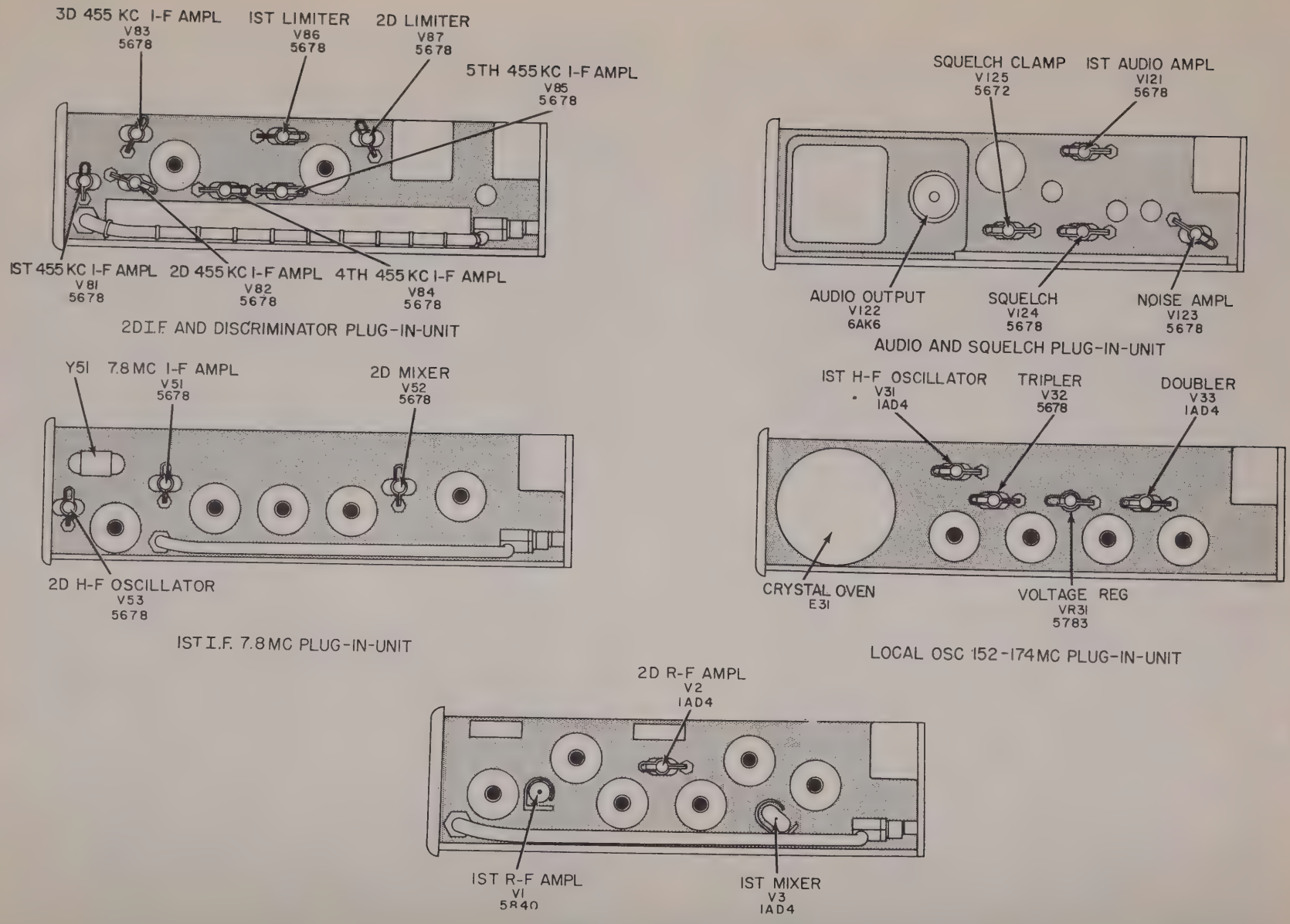


Figure 34. Radio Receiver R-394/U tube location.

a. Preparatory Operations (cont'd)

Item No.	Unit	Item	Action or condition	Normal indications	Corrective measures
5		Control cable (20-wire).	Connected to TB804 and TB805.		
6	Radio Set Control C-847/U	Control cable (20-wire).	Connected to TB1501 and TB1502.		
7		Handset cable.	Connected to HANDSET jack.		
8		VOLUME-OFF switch.	Set to OFF.		
9		FREQ 1-2 switch.	Set to 1 or 2.		
10		SPKR ON-OFF switch.	Set to ON.		
11		SQUELCH-OFF control.	Set to OFF.		

b. Start.

Item No.	Unit	Item	Action or condition	Normal indications	Corrective measures
12	Radio Set Control C-847/U.	VOLUME OFF switch.	Set to a position other than OFF.	POWER indicator lights.	Check fuse F801. Check battery cable connection for poor contacts. Check cable to control for defect or poor connection. Check connections in cabinet. Check for a defective power switch in the control. Check for a defective POWER indicator lamp. Check for a defective fuse in the receiver power supply.

b. Start (cont'd)

Item No.	Unit	Item	Action or condition	Normal indications	Corrective measures
				A signal or noise is heard in the speaker or handset.	Check for a defective fuse in the receiver power supply. Check terminals 11 and 12 on terminal boards TB1502 and TB805 in the radio set control and cabinet respectively. Check receiver connections to cabinet. Refer to receiver instruction book.

c. Equipment Performance.

Item No.	Unit	Item	Action or condition	Normal indications	Corrective measures
13	Radio Set Control C-847/U.	SQUELCH-OFF control.	Turn counter-clockwise.	Without a signal, noise can be heard as the control is advanced until a certain point is reached, then the speaker and handset are quieted.	Check for a defective audio and squelch plug-in unit in the receiver. Check for a defective SQUELCH control or disable switch. Check for improper or poor connections in cabinet. Refer to the receiver instruction book.
				An incoming signal on the receiver frequency will operate the speaker and handset.	Check the antenna. Refer to receiver instruction book.

Item No.	Unit	Item	Action or condition	Normal indications	Corrective measures
14	Handset.	Push-to-talk switch.	Depress switch.	TRANSMIT indicator lights.	Check for a poor handset connection or switch. Check for defective transmitter power supply. Check for an incorrect connection in the cabinet or in the radio set control.
				The receiver is disabled.	Check the SQUELCH control. If in the OFF position turn it counterclockwise. Check jumper connections between terminals 3 and 4 of terminal board TB801 in the cabinet. Refer to receiver and transmitter instruction books.
				The transmitter power supply dynamotor can be heard.	Defective fuse in transmitter power supply.
			Release switch.	A signal or noise is heard in the the handset or speaker.	Same as for second normal indication in Item No. 12. Refer to transmitter power supply instruction book.
15	Radio Set Control C-847/U.	FREQ 1-2 switch.	Change to the other frequency.	The transmitted signal will be at a different frequency (check against appropriate receiving station).	Check for a defective or wrong crystal in the transmitter. Check for a defective oscillator tube in the transmitter. Check for continuity of the oscillator filament circuit.

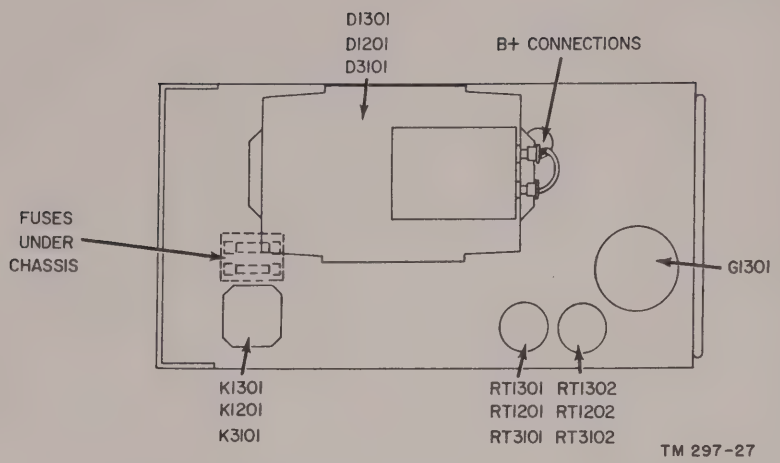


Figure 35. Transmitter power supply fuse and vibrator location.

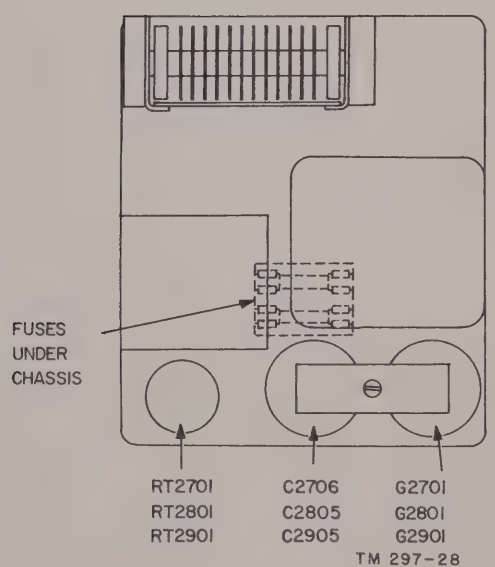


Figure 36. Receiver power supply fuse and vibrator location.

c. Equipment Performance (cont'd)

Item No.	Unit	Item	Action or condition	Normal indications	Corrective measures
					Refer to the transmitter instruction book.
16		SPKR ON-OFF switch.	Turn to OFF position.	Speaker will be inoperative; handset will operate.	Check for defective speaker switch or switch wiring.

d. Stop

Item No.	Unit	Item	Action or condition	Normal indications	Corrective measures
17	Handset H-33/PT.	Push-to-talk switch.	Release switch.	Transmitter is disabled.	Check for defective switch.
				TRANSMIT pilot lamp goes out.	Check for defective wiring or connections in cabinet.
					Check for a sticking relay in the transmitter power supply.
					Refer to the power supply instruction book.
18	Radio Set Control C-847/U.	VOLUME-OFF switch.	Turn counterclockwise to the OFF position.	POWER indicator goes out.	Check for incorrect cabinet wiring, a defective switch or relay. Refer to component instruction books.
				Receiver is inoperative.	Same as above.
				Transmitter is inoperative.	Same as above.

CHAPTER 4

THEORY

59. Scope

a. System theory is presented to provide an understanding of how the several units contained in the radio set function together to provide a complete system (par. 60). An understanding of the functioning of the complete system will aid in isolating troubles to a particular unit.

b. To familiarize personnel with the circuits contained in the transmitter, receiver, and power supplies, block diagrams of these units are discussed briefly in paragraphs 61 through 66. Detailed theory for these units is covered in separate publications. Since detailed theory for Radio Set Control C-847/U and Electrical Equipment Cabinet CY-938/VRC is not covered in a separate publication, it is discussed in this chapter (pars. 67 and 68).

60. System Theory (fig. 2)

a. The circuits of Radio Set AN/VRC-19(*) are built around Radio Transmitter T-278/U and Radio Receiver R-394/U. These components are plug-in units and require the use of Electrical Equipment Cabinet CY-938/VRC which serves as a container for the components and also has facilities for interconnecting the components. Since the system must be capable of operating from a 24-, 12-, or 6-volt or source (Radio Set AN/VRC-19, -19X, and 19Y respectively), individual plug-in power supplies are used for both the receiver and transmitter. The receiver power supply is contained within the receiver; the transmitter power supply is mounted external to the transmitter. When the system is changed from one voltage source to another, the proper power supplies for the receiver and transmitter (fig. 2) must be inserted.

b. The receiver and transmitter operate from the same antenna which is switched between the receiver and transmitter by a coaxial type relay. For simplicity of operation the radio set was designed to have a minimum number of operator manipulated controls; these controls are located on Radio Set Control C-847/U.

61. Block Diagram of Radio Transmitter T-278/U

The block diagram of Radio Transmitter T-278/U is shown in figure 37. For more detailed over-all circuit information, refer to the main schematic (fig. 64) and to the instruction book covering Radio Transmitter T-278/U. The signal paths through the transmitter are described below.

a. Frequency 1 and Frequency 2 Oscillators. Two crystal controlled oscillator stages, V401 and V402, are used to allow quick changing between two preset operating frequencies. The oscillator to be used is selected by the FREQ switch on Radio Set Control C-847/U which supplies filament voltage to one stage and removes it from the other. A frequency of 4.75 to 5.4375 mc, depending on the crystal used is developed in the oscillator and fed to phase modulator V403.

b. Phase Modulator. An audio signal from tube V413 is also applied to phase modulator tube V403. This combination of audio and r-f signals applied to the modulator produces a frequency-modulated signal in its output circuit which varies 468.75 cycles on each side of the oscillator resting (no audio signal) frequency for 100% modulation. The output of the modulator is applied to first doubler V404.

c. First, Second, Third, and Fourth Doublers, and Fifth Doubler and Driver. These stages are frequency multipliers and have single tuned plate circuits which operate at 2, 4, 8, 16, and 32 times the crystal frequency respectively to produce deviations of 937.5, 1875, 3750, 7500, and 15,000 cycles, respectively. Link coupling is used between the fourth and fifth doublers. The fifth doubler and driver is transformer coupled to power amplifiers V409 and V410.

d. Power Amplifiers. The power amplifiers consist of two type 2E24 tubes, V409 and V410, operated in push-pull. The plate tank has two tuning adjustments, a capacitor which is preset for the operating frequency and a shorting bar to provide variable inductance for fine tuning. The antenna coupling is adjusted by varying the coupling between the plate line and the output link. Power output from the final amplifier is applied to the antenna filter. The antenna filter reduces harmonic radiation.

e. First Audio Amplifier. Audio signals from the microphone of Handset H-33/PT or from the receiver (retransmission) are applied through an impedance matching transformer and a high-pass filter to the control grid of the first audio amplifier, V411 (5678). The output of this stage is coupled to the control grid of the limiter tube.

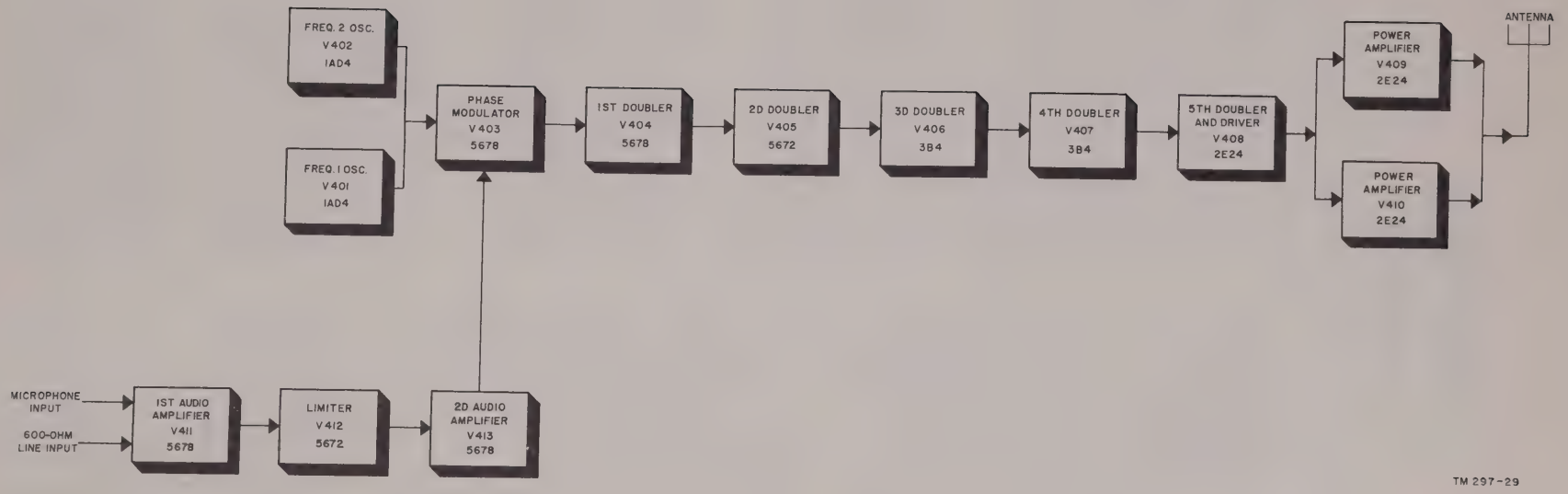


Figure 37. Block diagram of Radio Transmitter T-278/U.

THESE ADDENDA WILL REMAIN IN EFFECT UNTIL THE INFORMATION IS PUBLISHED IN AN OFFICIAL DEPARTMENT OF THE ARMY PUBLICATION.

ADDENDA
15 JUNE 1953

ADDENDA NO. 3 TO INSTRUCTION BOOK FOR RADIO SETS AN/VRC -19, -19X, -19Y

The following information, published on Order No. 11661-Phila-52, provides information in addition to that found in the instruction book. These addenda supersede Addenda No. 1, 30 March 1953 and Addenda No..2, 15 May 1953.

Personnel using this equipment and having custody of these addenda will enter suitable notations beside each affected paragraph and figure in the instruction book to indicate the presence of this supplementary information.

Change "Dynamotor DY-93/U" to read: Dynamotor - Power Supply DY-93/G, wherever it appears in the instruction book.

Change "Dynamotor DY-98/U" to read: Dynamotor - Power Supply DY-98/G, wherever it appears in the instruction book.

Page 9. Par. 12. Line 3. Change "12" to read: 13.

Page 9. Fig. 7. Change "TM 5092-527" to read: TM 297-201.

Page 11. Par. 15c. Change subparagraph c to read: The use of dynamotors limits the continuous operation time of the transmitter. Keep periods of transmission as short as possible to prevent dynamotor overheating.

Page 12. Par. 20. Line 4. Change "impedance is 150 ohms" to read: resistance is 300 ohms.

Page 20. Fig. 21. Reverse the numbering of connection 1 and 2 on terminal board TB806.

Page 21. Par. 26g. Lines 10 thru 16. Change sentences 5, 6, and 7 to read: Each of the components (receiver, transmitter and transmitter power supply) is held in place by a cam head fastener. The cam-head is at the back of the component and has an extension to a handle on the front panel. The component is released by turning the handle counterclockwise.

Page 21. Par. 26g. Line 2 from bottom of subparagraph g. Change "holding nut" to read: handle.

Page 23. Par. 30. Control column. Item SQUELCH-OFF. Change "SQUELCH-OFF" to read: SQUELCH-ON-OFF.

Page 23. Fig. 22. Add the panel marking ON to the left position of the SQUELCH control.

Page 31. Make the following changes.

Par. 43b. Change Caution to read: Keep periods of transmitter operation as short as possible to prevent overheating of the transmitter power supply dynamotor.

Par. 43b(3). Line 11. Change "two-thirds" to read: nine tenths.

Par. 43b(3). Line 13. Change "-3.5" to read: -5.

Par. 43b(6). Line 4. Change "-75" to read: -70.

Par. 43b(9). Add the following after CAUTION:

Caution: When using a voltmeter with a metal case across the PL CUR jacks make sure that you do not touch the case of the meter. There is a high potential at this point.

Page 34. Make the following changes.

Par. 44a(2). Change subparagraph (2) to read: Remove the top cover and the plug-in assembly marked LOCAL OSC 152-174 MC.

Par. 44a(3). Line 1. Change "shields" to read: shield.

Par. 42a(6). Line 2. Change "figure 28" to read: figures 7 and 28.

Page 37. Par. 45. Line 9. Change "30 inches" to read: 48 inches.

Page 42. Fig. 32. Delete locking studs from illustration.

Page 43. Fig. 33. Delete the following: "5TH DBLR AND DRIVER 2E26 IN RADIO XMTR T-416/GR" and "PWR AMPL 5894A IN RADIO XMTR T-416/GR".

Page 44. Fig. 34. AUDIO AND SQUELCH PLUG-IN-UNIT. Change "AUDIO OUTPUT V122 6AK6" to read: AUDIO POWER AMPL V122 6AK6.

In illustration of LOCAL OSC 152-174 MC PLUG-IN-UNIT change "VR31" to read: V34.

In illustration of 1ST I.F. 7.8 MC PLUG-IN-UNIT, reverse "7.8 MC I-F AMPL V51 5678" and 2D MIXER V52 5678".

Page 53. Fig. 38. Change "AUDIO OUTPUT V122 6AK6" to read: AUDIO POWER AMPL V122 6AK6.

Page 55. Par. 62e. Line 13. Change "VR31" to read: V34.

Page 61. Fig. 44. Make the following changes:

Add a jumper between terminals 3 and 4 of TB801.

Add a jumper between terminals 5 and 6 and another between terminals 8 and 9 of TB802.

Change "Filament 6V" at terminal 7 of TB804 to read: Filament 1.25V.

Reverse terminals 28 and 29 of jack J803.

Page 63. Fig. 45. Make the following changes: Change the value of resistor R1504 from "15" to 10 ohms.

Reverse terminals 11 and 12 on terminal board TB 1502.

Change "6V" at terminal 7 of TB1501 to read: 1.25 V DC.

On equipment with serial numbers beginning with 496, add a terminal number 3 to terminal board TB1501 and connect it to pin K of jack J1501.

On equipment with serial numbers beginning with 601; add a jumper between pins E and H of jack J1501, delete the lead between terminal 19 of TB1502 and pin D of jack J1501, and reverse the numbers on pins "19" and "20" of TB1502.

Page 64. Fig. 46. Change "AUDIO OUTPUT V122 6AK6" to read: AUDIO POWER AMPL V122 6AK6.

Page 65. Make the following changes:

Add the following to the end of paragraph 68b(3). On equipment beginning with serial number 601, the output of the handset microphone is taken from the control unit through terminal C of J1501 and terminal 19 of TB1502.

Par. 68b(4). Line 8. Change "6-volt" to read: 1.25-volts.

Line 16. Change "6-volts" to read: 1.25 volts.

Line 29. Change "less" to read: more.

Par. 69b. Seventh line from bottom of page. Change "(15 ohms)" to read: (10 ohms).

Page 66. Fig. 47. Make the following changes.

In illustration C change the value of resistor R1504 from "15" to 10 ohms.

In equivalent circuit of illustration C change "15" to read: 10.

Page 67. Fig. 48. Add figure 48.1 after figure 48.

Page 67. Par. 70a. Line 3. Change "(terminals 1 and 3)" to read: (terminals 1 and 2).

Page 68. Fig. 49. Change "POWER AMPL V122 6AK6" to read: AUDIO POWER AMPL V122 6AK6.

Page 71. Fig. 50. Make the following changes.

Change "HR 401 XMTR OVEN" to read: E401 XMTR OVEN.

Change "L P271" to read: P P271.

Change "L J263" to read: P J263.

Change "29 P252" to read: 28 P252.

Change "29 J803" to read: 28 J803.

Change R410 from "10" to 15 ohms.

Page 73. Fig. 51. Make the following changes. Add "SEE NOTE 7" to JUMPER between terminals 3 and 4 of TB802.

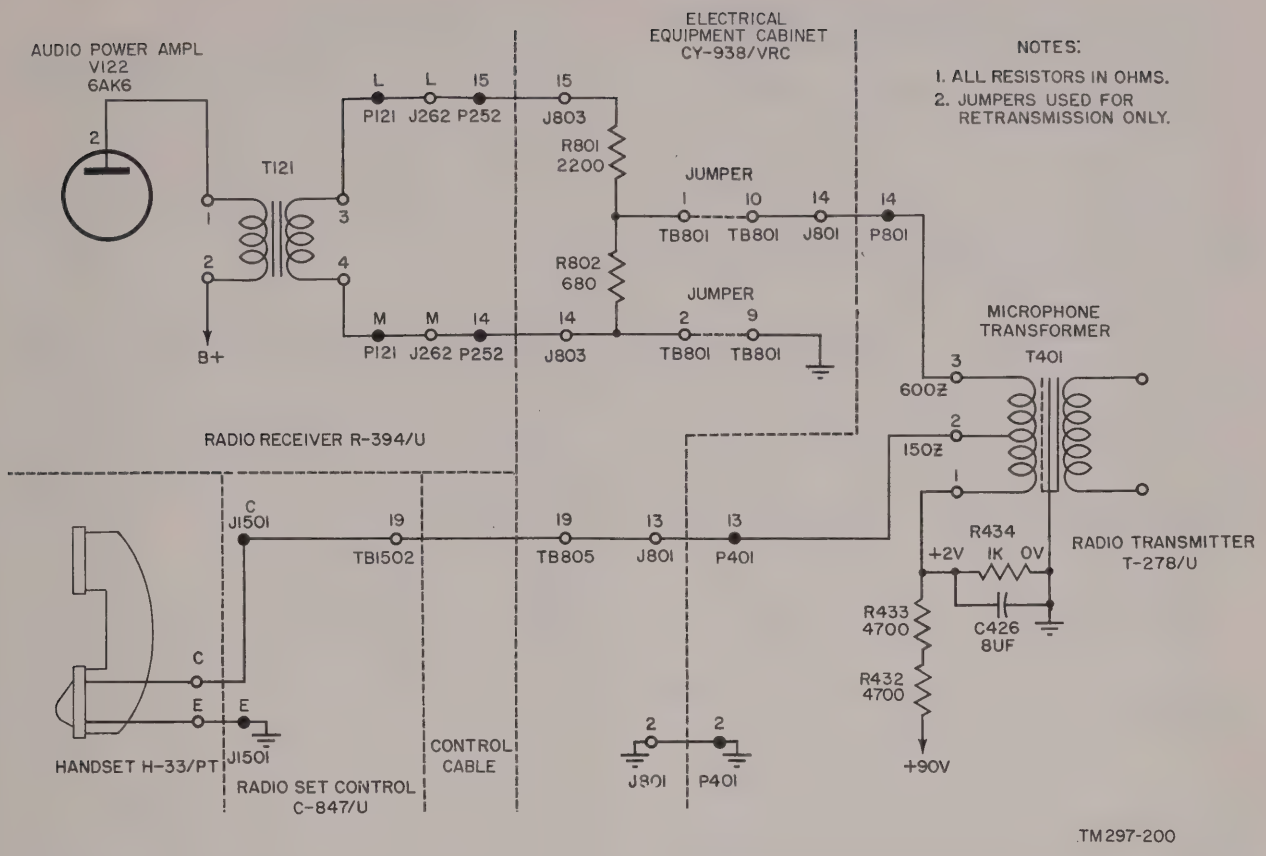


Figure 48.1. Microphone and retransmission audio circuits (on equipment beginning with serial number 601).

Add the following after NOTE 6: 7. Connect jumper for 12-volt operation.

Change "2 P252" to read: 19 P252.

Change "15 P251" to read: 1 P251.

Change "HR 401 XMTR OVEN" to read: E401 XMTR OVEN.

Change "L P271" to read: P P271.

Change "L J263" to read: P J263.

Change "29 P252" to read: 28 P252.

Change "29 J803" to read: 28 J803.

Change R410 from "10" to 15.

Page 75. Fig. 52. Make the following changes. Change "HR401 XMTR OVEN" to read: E401 XMTR OVEN.

Change "L P271" to read: P P271.

Change "L J263" to read: P J263.

Change "29 P252" to read: 28 P252.

Change "29 J803" to read: 28 J803.

Change R410 from "10" to 15.

Page 77. Par. 74b. Line 1. Change "HR401" to read: E401.

Page 89. Fig. 53. Bottom of illustration.

The physical location of J1501 and the cable entrance hole should be reversed.

Page 89. Fig. 54. Make the following changes. Insert a wire to terminals 3 and 4 of TB802 from the same cable that supplies the other terminals.

Add a jumper between terminal 5 and 6 of TB802.

Add a jumper between terminals 8 and 9 of TB802.

Add a jumper between terminals 3 and 4 of TB801.

Page 98. Fig. 57. On relay K1203, change terminal "4" to read: 6 and "6" to read: 4.

On resistance RT1201 and RT1202, change terminal "2" to read: 7 and "7" to read: 2.

Add the symbol 2 as a chassis marking next to P1201.

Add the symbol 1 as a chassis marking next to P1202.

Page 99. Fig. 58. On relay K3103, change terminal "4" to read: 6 and "6" to read: 4.

Add the symbol 2 as a chassis marking next to P3101.

Add the symbol 1 as a chassis marking next to P3102.

Page 100. Fig. 59. On resistance RT1301 and RT1302, change terminal "2" to read: 7 and "7" to read: 2.

Add the symbol 2 as a chassis marking next to P1301.

Add the symbol 1 as a chassis marking next to P1302.

Reverse the positions of R1301 and L1301.

Page 103. Fig. 62. Add a capacitor, C2908, .01 UF, between chassis ground and terminal 3 of G2901.

Add an inductance, L2903 6.5 UH, between terminal 3 of F2901 and terminal 11 of T2901.

Add an inductance, L2904 6.5 UH, between terminal 4 of G2901 and capacitor C2903.

Add an inductance, L2902 6.5 UH, between terminal 2 of G2901 and capacitor C2901.

Page 105. Fig. 63. Insert figure 63.1 after figure 63.

Page 107. Fig. 64. Make the following changes in figure 64. Change "HR401" to read: E401.

Delete capacitors C464 and C465.

Change R410 from "10" to 15.

Change C463 from "500" to 510.

Reverse reference symbols "R458" and "R474", but leave the values as they are.

Change C456 from "250" to 240.

Change C429, C437, and C439 from "25" to 4-23.

Delete "R473, 4700" and replace it with coil L411 1.5UH.

On equipment bearing serial numbers beginning with 496, change R414 "680K" to read: 560K.

On equipment bearing serial numbers beginning with 601, delete the lead between pin 15 of P401 and the junction of C426 and R434, delete the ground symbol at terminal 1 of T401, and connect a lead between terminal 1 of T401 and the junction of C426 and R434.

Page 109. Fig. 65. Make the following changes on figure 65. Connect a jumper between terminals 5 and 6 and another between terminals 8 and 9 of TB802.

Connect a jumper between terminals 3 and 4 of TB801.

Delete the RED 1 lead from terminal 1 of J802 and also the RED 1 lead from F801. Make a direct cable connection between these two points.

Page 111. Fig. 66. Make the following changes on figure 66.

Note 5. Delete the word "and".

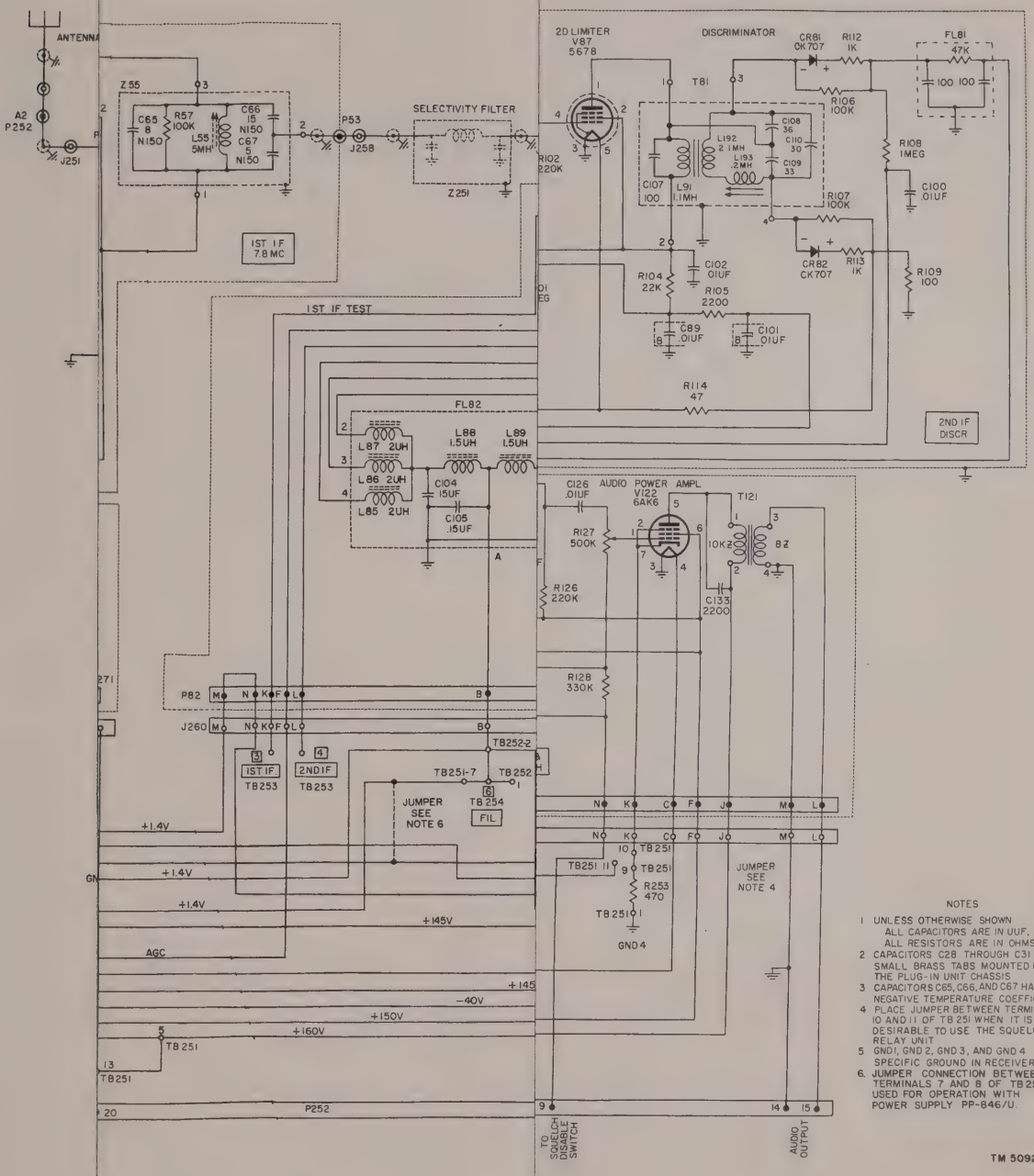
Connect a jumper between terminals 3 and 4 of TB801.

Connect a jumper between terminals 5 and 6 and another between terminals 8 and 9 of TB802.

Page 121. App. II. Par.2. Make the following change.

Item R1502, R1503. Ref. symbol column.

Change R1502, R1503 to read: R1502, R1503, R1504.



NOTES

1. UNLESS OTHERWISE SHOWN ALL CAPACITORS ARE IN UUF, ALL RESISTORS ARE IN OHMS
2. CAPACITORS C28 THROUGH C31 ARE SMALL BRASS TABS MOUNTED BELOW THE PLUG-IN UNIT CHASSIS
3. CAPACITORS C65, C66, AND C67 HAVE A NEGATIVE TEMPERATURE COEFFICIENT
4. PLACE JUMPER BETWEEN TERMINALS 10 AND 11 OF TB 251 WHEN IT IS DESIRABLE TO USE THE SQUELCH RELAY UNIT
5. GND1, GND 2, GND 3, AND GND 4 SPECIFIC GROUND IN RECEIVER BASE
6. JUMPER CONNECTION BETWEEN TERMINALS 7 AND 8 OF TB 251 USED FOR OPERATION WITH POWER SUPPLY PP-846/U.

TM 5092-610

R-394/U, schematic diagram.

On resistance RT1201 and RT1202, change terminal "2" to read: 7 and "7" to read: 2.

Add the symbol 2 as a chassis marking next to P1201.

Add the symbol 1 as a chassis marking next to P1202.

Page 99. Fig. 58. On relay K3103, change terminal "4" to read: 6 and "6" to read: 4.

Add the symbol 2 as a chassis marking next to P3101.

Add the symbol 1 as a chassis marking next to P3102.

Page 100. Fig. 59. On resistance RT1301 and RT1302, change terminal "2" to read: 7 and "7" to read: 2.

Add the symbol 2 as a chassis marking next to P1301.

Add the symbol 1 as a chassis marking next to P1302.

Reverse the positions of R1301 and L1301.

Page 103. Fig. 62. Add a capacitor, C2908, .01 UF, between chassis ground and terminal 3 of G2901.

Add an inductance, L2903 6.5 UH, between terminal 3 of F2901 and terminal 11 of T2901.

Add an inductance, L2904 6.5 UH, between terminal 4 of G2901 and capacitor C2903.

Add an inductance, L2902 6.5 UH, between terminal 2 of G2901 and capacitor C2901.

Page 105. Fig. 63. Insert figure 63.1 after figure 63.

Page 107. Fig. 64. Make the following changes in figure 64. Change "HR401" to read: E401.

Delete capacitors C464 and C465.

Change R410 from "10" to 15.

Change C463 from "500" to 510.

Reverse reference symbols "R458" and "R474", but leave the values as they are.

Change C456 from "250" to 240.

Change C429, C437, and C439 from "25" to 4-23.

Delete "R473, 4700" and replace it with coil L411 1.5UH.

On equipment bearing serial numbers beginning with 496, change R414 "680K" to read: 560K.

On equipment bearing serial numbers beginning with 601, delete the lead between pin 15 of P401 and the junction of C426 and R434, delete the ground symbol at terminal 1 of T401, and connect a lead between terminal 1 of T401 and the junction of C426 and R434.

Page 109. Fig. 65. Make the following changes on figure 65. Connect a jumper between terminals 5 and 6 and another between terminals 8 and 9 of TB802.

Connect a jumper between terminals 3 and 4 of TB801.

Delete the RED 1 lead from terminal 1 of J802 and also the RED 1 lead from F801. Make a direct cable connection between these two points.

Page 111. Fig. 66. Make the following changes on figure 66.

Note 5. Delete the word "and".

Connect a jumper between terminals 3 and 4 of TB801.

Connect a jumper between terminals 5 and 6 and another between terminals 8 and 9 of TB802.

Page 121. App. II. Par.2. Make the following change.

Item R1502, R1503. Ref. symbol column.

Change R1502, R1503 to read: R1502, R1503, R1504.

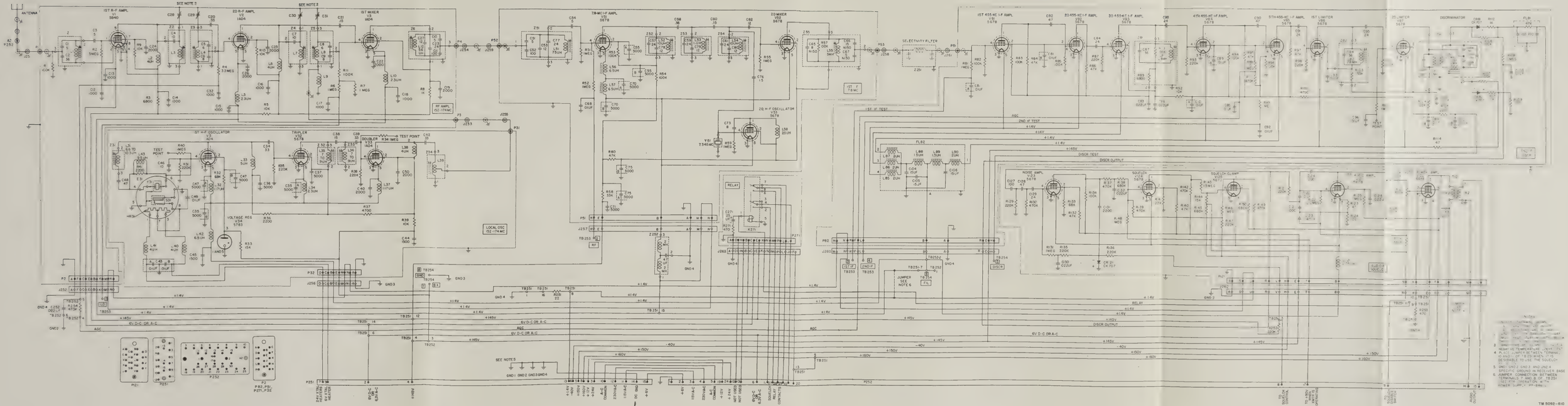
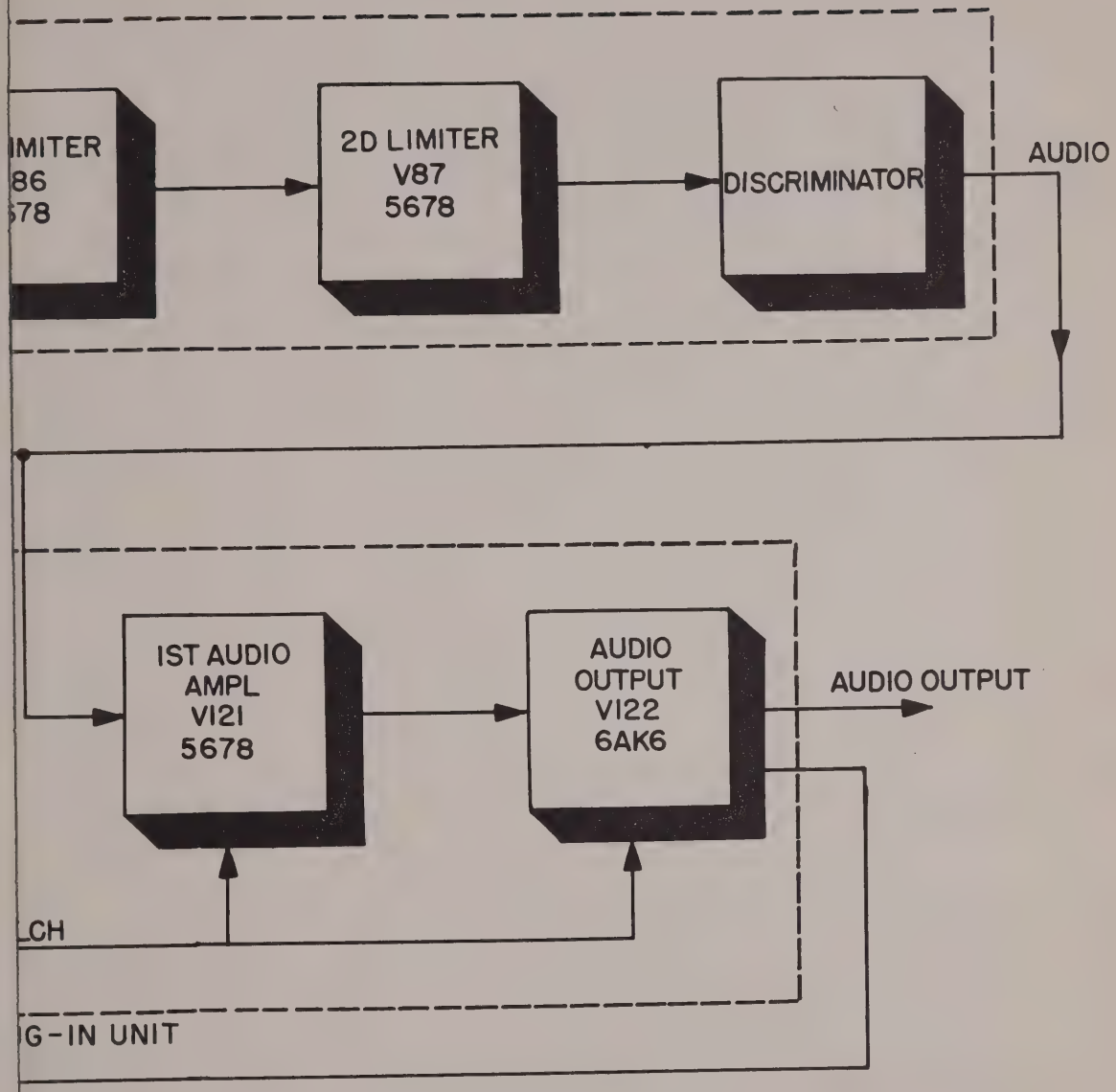


Figure 63.1. Radio Receiver R-394/U, schematic diagram.


IMITER
86
678
2D LIMITER
V87
5678
DISCRIMINATOR
AUDIO
IST AUDIO
AMPL
V121
5678
AUDIO
OUTPUT
V122
6AK6
AUDIO OUTPUT
CH
G-IN UNIT

TM 297-47

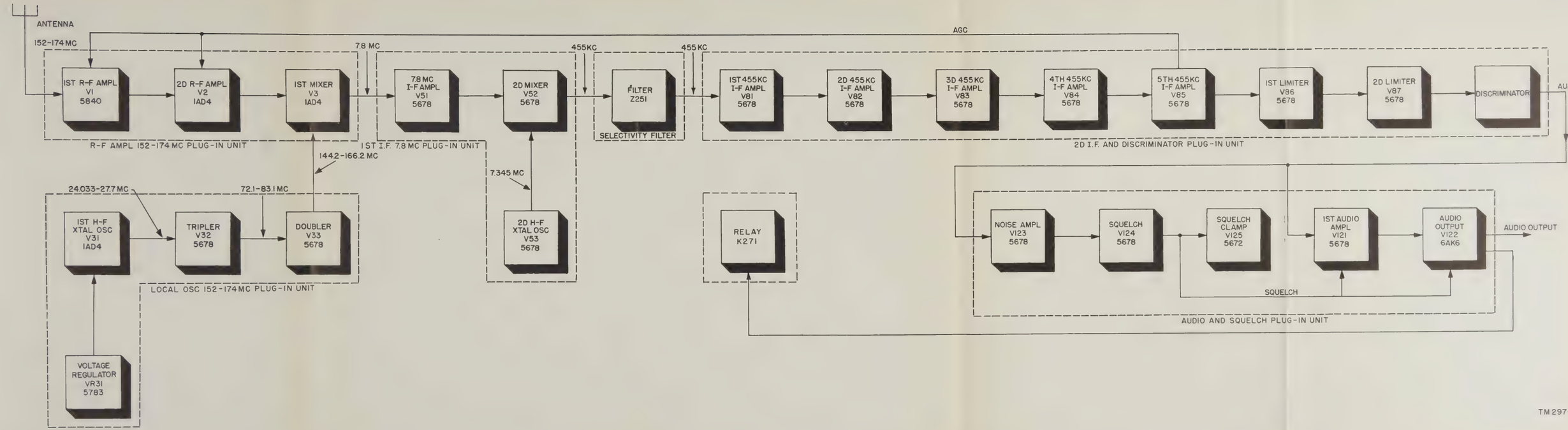


Figure 38. Block diagram of Radio Receiver R-394/U.

f. Limiter. Limiter tube, V412 is a type 5672 tube and serves to limit the magnitude of strong audio signals in order to keep the transmitter deviation below its maximum limit. The output of the limiter is applied to the second audio amplifier through a waveshaping network.

g. Second Audio Amplifier. The audio signal from the limiter stage is further amplified by the second audio amplifier, V413, a subminiature type 5678 tube. Audio output from this tube is applied to the control grid of the phase modulator tube to produce a phase modulated signal as discussed in subparagraph b above.

62. Block diagram of Radio Receiver R-394/U

a. General. The signal paths through the receiver are shown in the block diagram (fig. 38) and a complete schematic diagram is shown in figure 63. For a more detailed explanation of the receiver circuits refer to the instruction book covering Radio Receiver R-394/U.

b. R-F AMPL 152-174 MC Plug-In Unit. An f-m signal from the antenna is fed to first r-f amplifier V1 where it is amplified, and then amplified still further by the action of second r-f amplifier V2. The two r-f amplifiers also improve the signal plus noise-to-noise ratio and the image and i-f rejection ratio of the receiver. Gain of the r-f amplifiers is controlled by a delayed agc (automatic gain control) voltage developed in the grid circuit of fifth 455-kc i-f amplifier V85. The amplified signal is coupled into first mixer V3 where it is heterodyned with a signal from the local oscillator 152-174 MC plug-unit (V31, V32, V33), the output of which is 7.8 mc lower in frequency than the incoming r-f signal. Sum and difference beat frequencies result, but only the difference frequency is accepted by the following stage, 7.8 mc i-f amplifier V51.

c. First I-F 7.8-MC Plug-In Unit. The 7.8-mc i-f signal is amplified in 7.8 mc i-f amplifier, V51 and coupled to second mixer V52 where it is heterodyned with a 7.345-mc signal from second h-f crystal oscillator V53. As a result of the heterodyning, a second i.f. of 455 kc is developed. This i.f signal is applied to first 455-kc i-f amplifier V81 through a selectivity filter (Z251). The filter functions to limit the bandwidth of the i-f signal to 15 kc above and below 455 kc.

d. Second I.F and Discriminator Plug-In Unit. The i-f signal is amplified by five 455-kc i-f amplifiers, V81 thru V85. A portion of the negative d-c voltage developed at the grid of fifth 455-kc i-f amplifier V85 is used as a delayed agc voltage to control the gain of first and second r-f amplifiers V1 and V2. The output of V85 passes through two limiters, V86 and V87, which perform the function of maintaining a constant amplitude voltage input to the discriminator even though the signal from the antenna may fluctuate. They also eliminate noise which may be superimposed on the signal. Discriminator rectifiers CR81 and CR82 change the frequency-modulated i-f signal into an audio voltage, which is applied to first audio amplifier V121 for amplification.

e. Local Oscillator 152-174 MC Plug-In Unit. The local oscillator plug-in unit contains first h-f oscillator V31 which produces signals between the frequency limits of 24.033 mc and 27.7 mc. Tripler V32 multiplies this frequency by a factor of 3, and doubler V33 by a factor of 2. The resultant multiplication factor of six provides an output signal within the frequency range of 144.2 mc to 166.2 mc. The frequency of operation of the oscillator (V31) is stabilized by inclosing its crystal in a plug-in type temperature controlled oven (Y31, fig. 63). Additional stability is provided by voltage regulator VR31, which maintains the screen grid of the oscillator at a constant potential. The output of the local oscillator plug-in unit is applied to first mixer V3 as explained in subparagraph b above.

f. Audio and Squelch Plug-In Unit. Audio signals from the discriminator (subpar. d above) are amplified by first audio amplifier V121 and audio output (power amplifier) V122 to a level that is sufficiently high to drive Handset H-33/PT or the loud speaker in Radio Set Control C-847/U. Noise signals from the discriminator also are fed to noise amplifier V123 where they are amplified and coupled to squelch tube V124. The squelch tube makes first audio amplifier V121 and audio output tube V122 inoperative when no signal is being received; thus excessive noise will not be heard in the earphone or speaker during periods of no signal reception. Squelch clamp tube V125 acts to prevent the control voltage from the squelch tube (V124) from going positive when a signal is being received. A combination SQUELCH control and disabling switch is provided on Radio Set Control C-847/U.

63. Block Diagram of Dynamotor-Power Supply DY-100/U

a. The power and control circuits in Dynamotor-Power Supply DY-100/U are shown in the block diagram, figure 39, and are discussed in subparagraph b below. For a more detailed explanation refer to the instruction book covering Dynamotor-Power Supply DY-100/U. This dynamotor supplies power to the transmitter when a 6-volt storage battery is used as the primary power source.

b. A single multipin connector, P1203, connects the power supply to Electrical Equipment Cabinet CY-938/VRC. Since the battery supply is 6 volts, it can be used in the 6-volt circuits without the use of vibrators and transformers. The input current which is needed to operate the power supply is con-

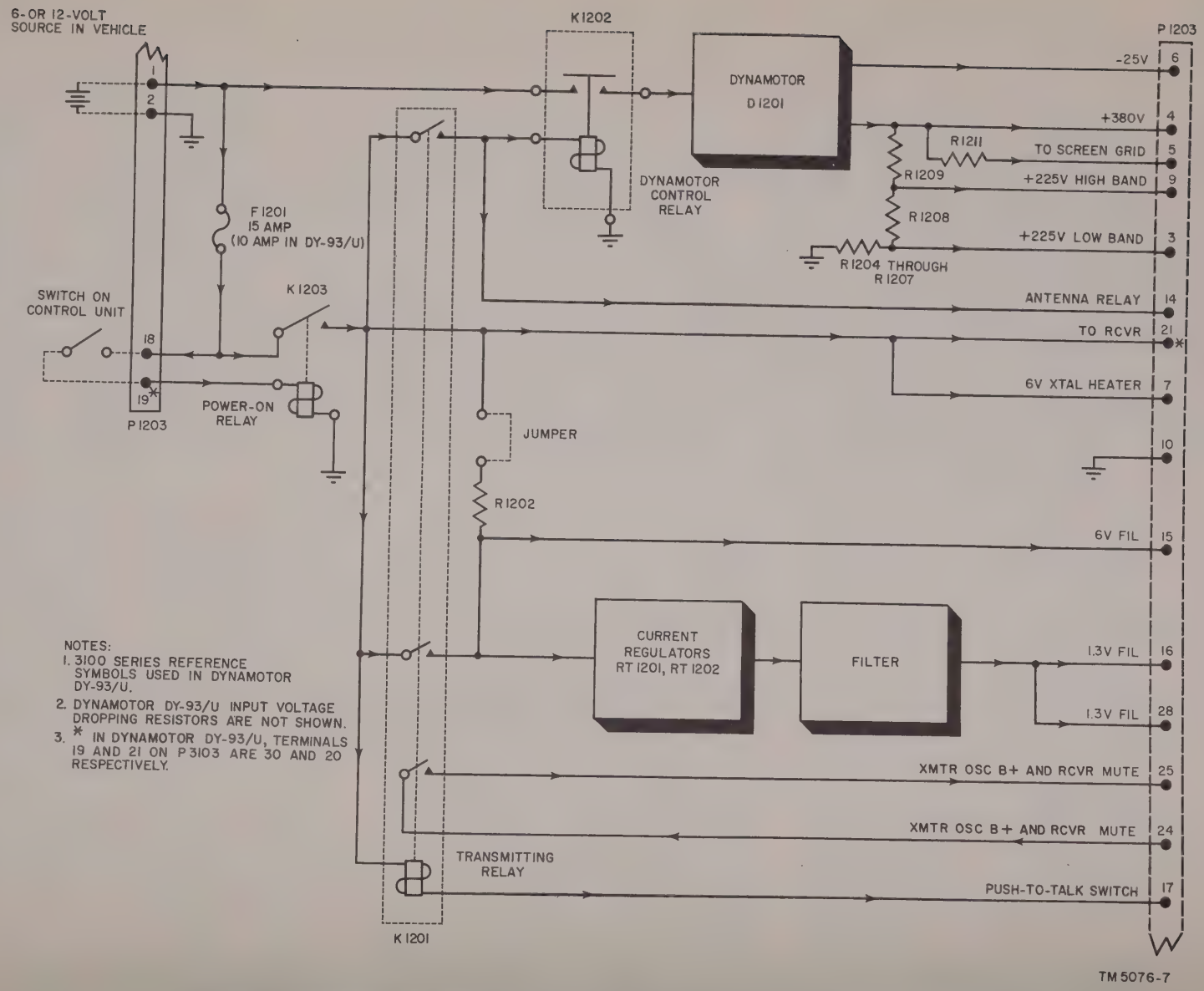


Figure 39. Dynamotor-Power Supply DY-100/U and Dynamotor DY-93/U, functional block diagram.

trolled by power-on relay K1203. This relay is energized by the VOLUME-OFF switch on the radio set control, and distributes the battery voltage to the receiver power supply to the coil and contacts of relay K1201, and to the internal circuits of the transmitter power supply. When relay K1201 is actuated (push-to-talk switch on Handset H-33/PT depressed), it supplies voltage to the filament and dynamotor circuits. In addition to controlling the above voltages, power supply relay K1201 also actuates the antenna change-over relay in the transmitter and closes a receiver mute circuit. The input current for the dynamotor is controlled by contractor K1202, which is energized through contacts of relay K1201. Dynamotor D1201 supplies B+ voltages of 380 volts and 225 volts, and a bias voltage of 25 volts to the transmitter. Voltage regulation is provided for in the 1.3-volt filament circuit by means of two current regulating tubes, R1201 and R1202. The output of the filament circuit is applied through two paths to the transmitter.

64. Block Diagram of Dynamotor DY-93/U

The circuits of Dynamotor DY-93/U are very similar to those in Dynamotor-Power Supply DY-100/U, discussed above (fig. 39). The main difference between the power supplies is that several additional voltage dropping resistors are required in Dynamotor DY-93/U to reduce the 12-volt input voltage to 6-volts. Refer to the main schematic, shown in figure 58, for these differences.

65. Block Diagram of Dynamotor-Power Supply DY-98/G

a. The power and control circuits in Dynamotor-Power Supply DY-98/G are shown in the block diagram, figure 40, and are discussed in subparagraph b below. The main schematic diagram is shown in figure 59.

b. The high-voltage section of Dynamotor-Power Supply DY-98/G is similar to the h-v section in the 6- and 12-volt power supplies; however, the manner in which the filament voltage is derived is quite different. In this power supply, the 24-volt input is changed to a-c by vibrator G-1301 and applied to transformer T1301. The 6-volt tube filaments of the transmitter are provided with a-c voltage from the secondary of the transformer. A portion of the secondary voltage is rectified by full wave selenium rectifier CR1301 and applied to the 1.3-volt filament circuit through current regulators RT1301 and RT1302 and two filter sections. Note that the power-on relay (K1203), shown in the 6- and 12-volt block diagram (fig. 39), is not used in the 24-volt model. Because of the lower input current in the 24-volt model, the VOLUME-OFF switch on the radio set control is used to control relay K1301 directly instead of through a power-on relay.

66. Block Diagrams of Power Supplies PP-867/U, PP-868/U, and PP-869/U

a. The circuits in Power Supplies PP-867/U, PP-868/U, and PP-869/U are shown in the block diagrams, figures 41, 42, and 43, and are discussed in subparagraph b below. The main schematic diagrams are shown in figures 60, 61, and 62. For a more detailed explanation refer to the instruction book covering Power Supplies PP-867/U, PP-868/U, and PP-869/U.

b. The circuits of the power supplies are very similar with minor exceptions. Power Supply PP-868/U (12-volt model) contains a vibrator and transformer to develop the three high voltages, the bias voltage, and the filament and crystal oven voltages required for the receiver. The 6-volt model, Power Supply PP-869/U, uses the same arrangement but has one less secondary winding on the power transformer. This winding can be eliminated because the primary source voltage of 6 volts is fed directly through the power supply to the receiver 6-volt tube filaments and to the 6-volt crystal oven. In the 12-volt version, Power Supply PP-868/U, a 6.3-volt winding on the transformer supplies the 6-volt heater and crystal oven potential. Power Supply PP-867/U also uses the additional 6.3-volt winding; however, it is used only for the filaments of the two 6.3-volt receiver tubes. The primary power source voltage of 24 volts passes through the power supply to operate the 24-volt receiver crystal oven. The above differences in circuits can readily be seen by comparing the schematic diagrams of the three power supplies.

67. Theory of Electrical Equipment Cabinet CY-938/VRC

A schematic diagram of Electrical Equipment Cabinet CY-938/VRC is shown in figure 44. As can be seen from the illustration the cabinet consists of numerous connectors and cables of wires to make the interconnections between components. The connections between the terminal boards and jacks represent wiring which would ordinarily be in cables between the components. Radio Set AN/VRC-19(*) has been designed so that interconnections are contained mostly in the cabinet and in conjunction with the jacks allow simplified and automatic connections when the components are installed in the cabinet. The wiring is intricately related to all of the components in the radio set and, therefore, can not be explained separately. The information concerning the wiring is given throughout this chapter. Besides the internal wiring of the cabinet there are connections to three external circuits. One is the antenna circuit which connects through a coaxial cable to the side of the cabinet.

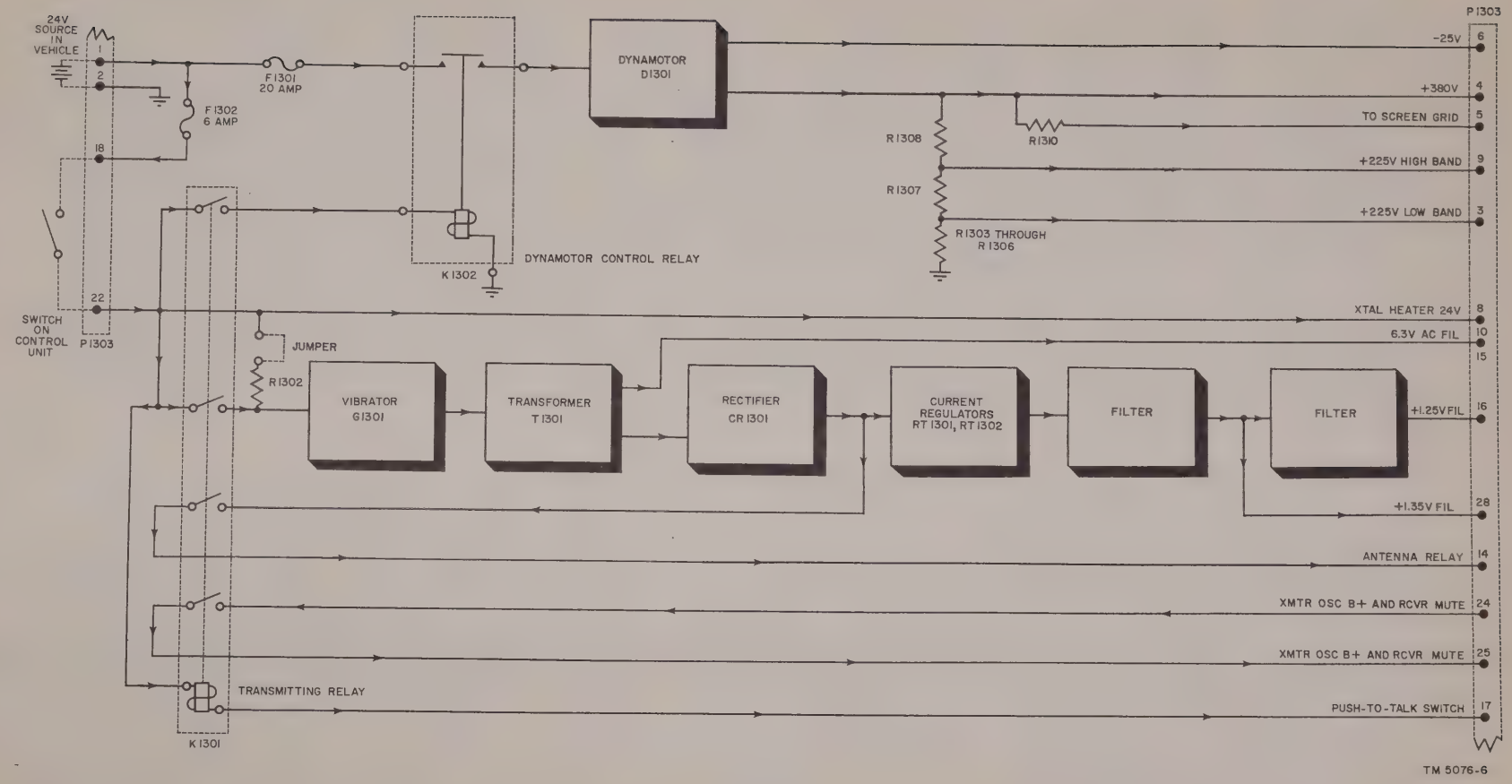


Figure 40. Dynamotor-Power Supply DY-98/G, functional block diagram.

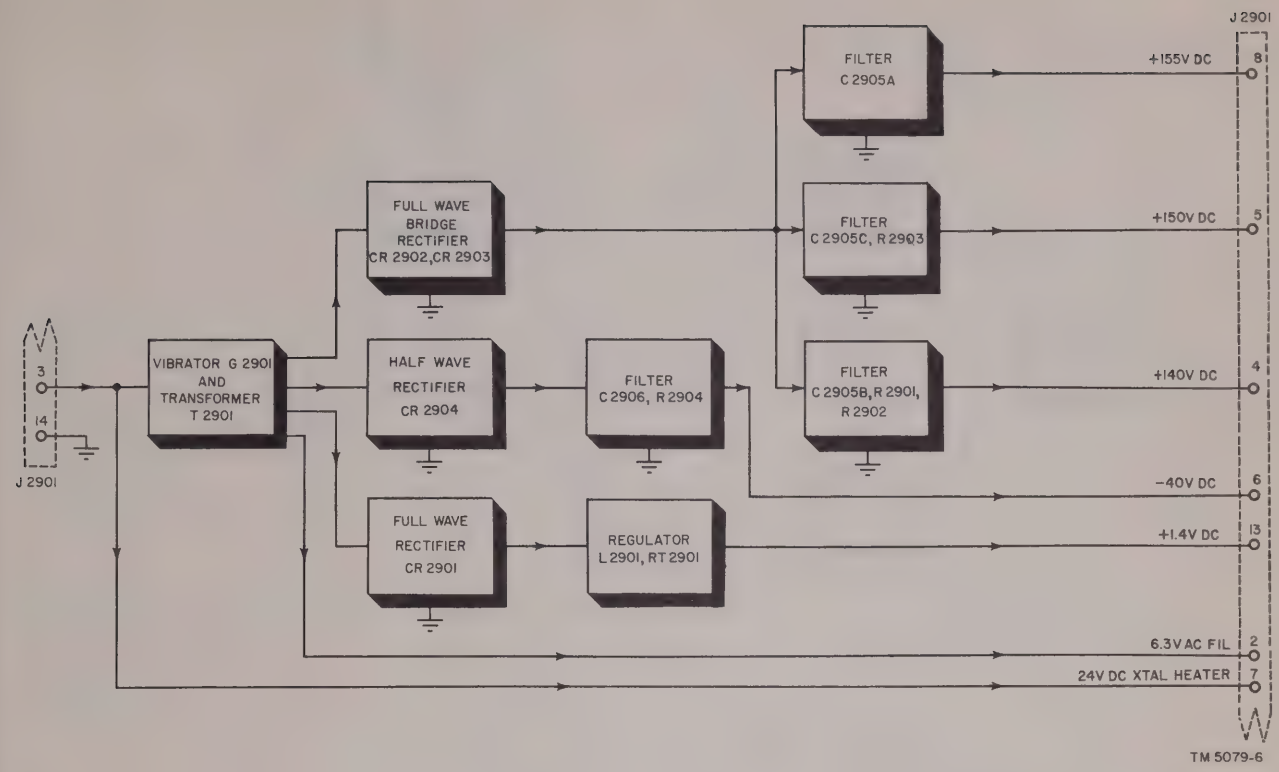


Figure 41. Power Supply PP-869/U, functional block diagram.

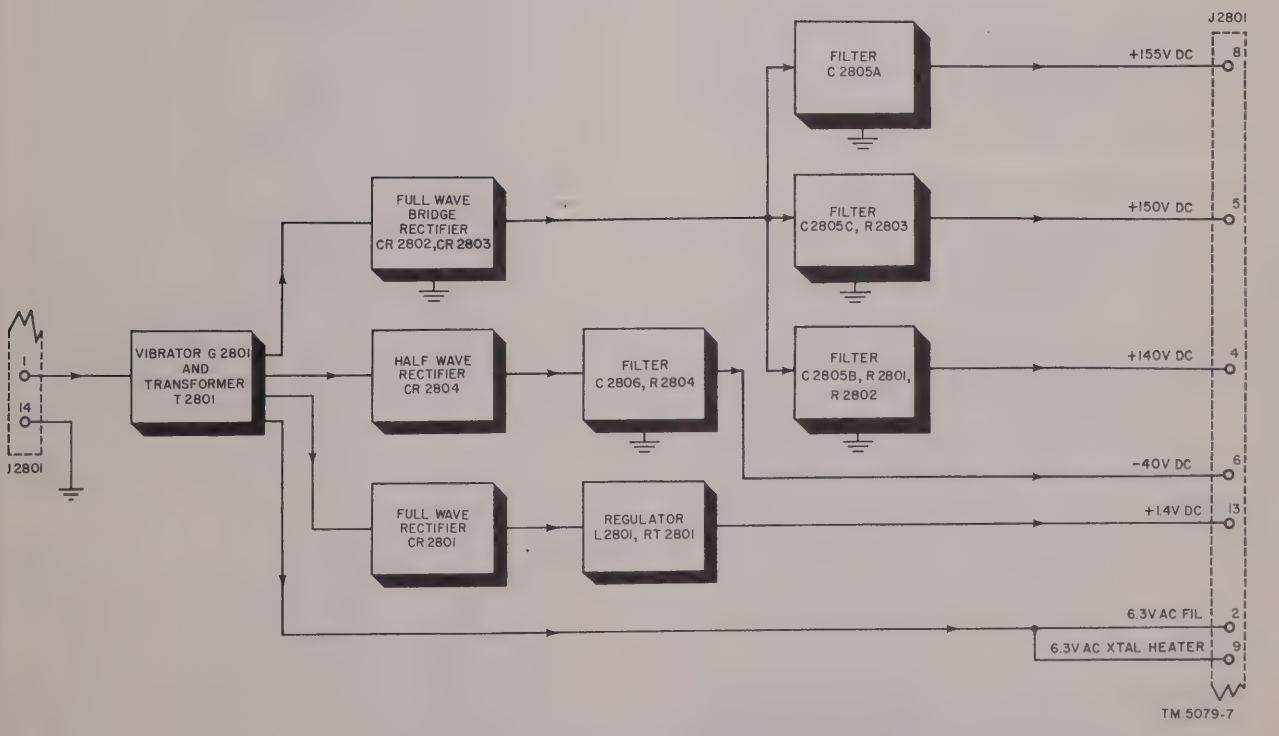


Figure 42. Power Supply PP-868/U functional block diagram.

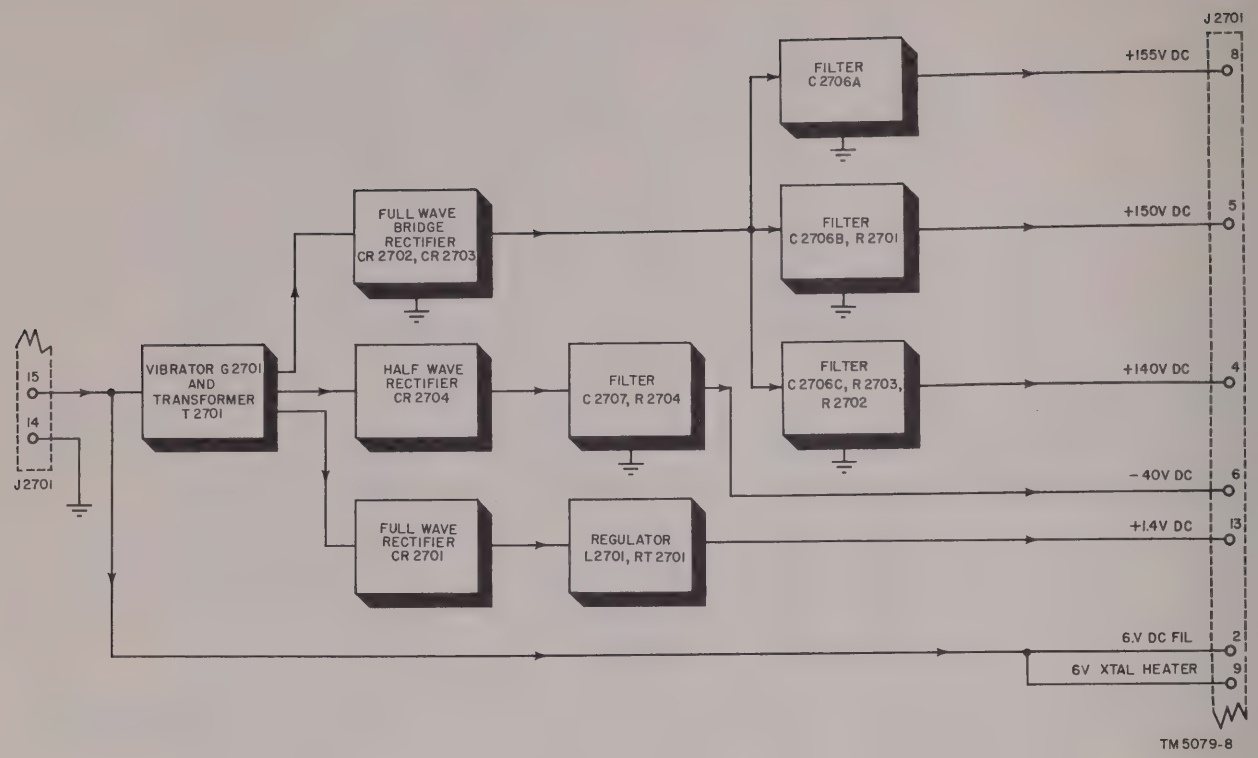


Figure 43. Power Supply PP-867/U functional block diagram.

The second circuit is used to bring the d-c power from the battery source in the vehicle, and contains a fuse (F801) which has a capacity of 50 amperes and which protects the power source. The third circuit consists of a 20-wire cable which connects the cabinet to Radio Set Control C-847/U. The wires in the cable are connected to terminal boards TB804 and TB805 in the cabinet.

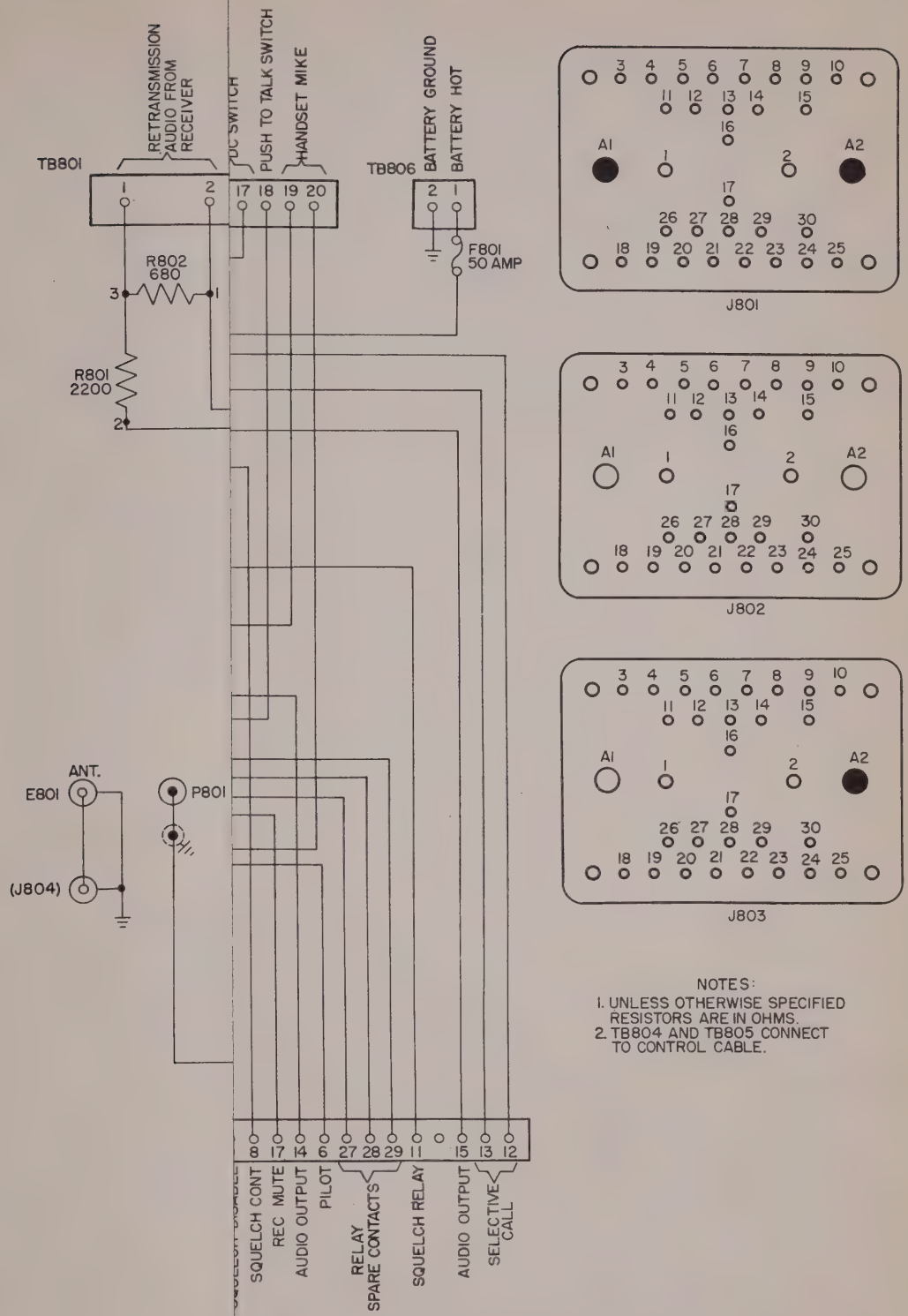
68. Theory of Radio Set Control C-847/U

a. General. Radio Set Control C-847/U controls the radio set after the presetting adjustments have been made. The circuits of the control are connected to Electrical Equipment Cabinet CY-938/VRC through a 20-wire cable where they are distributed to the other components. The circuits fall into three general categories, audio, control, and indication. Since most of the circuits in the set control depend on the operation of circuits in other components they are not described in detail in this paragraph, but are combined with other circuits discussed elsewhere in this chapter. Refer to figure 45 for the schematic diagram of the control.

b. Circuits. The following circuits are contained in the control:

(1) General. Power switch S1501B controls the power to the radio set. It is coupled mechanically to the VOLUME switch S1501A so that only one knob is necessary for both power and VOLUME control. In the OFF position of this control, S1501B is open, which prevents power from being applied to the radio set. At the same time the connection through S1501A is incomplete so that audio cannot get through to the speaker or handset. The connections to the switch for d-c power are through terminals 16 and 17 of TB1502. The connections for 115-volt a-c power (not normally used in Radio Set AN/VRC-19(*) are through terminals 13 and 15 of TB1502. For more details on how to switch functions in the overall circuit refer to paragraphs 72, 73, and 74. Another of the power control switches is located in the handle of Handset H-33/PT. This is the push-to-talk switch which is interconnected through terminals 18 of TB1502 and 10 of TB1501. It is a low voltage switch used to energize power controlling relays which switch the radio set from receive to transmit conditions.

(2) Receiver audio. Signals from the receiver applied through terminals 11 and 12 of TB1502, pass through VOLUME switch S1501A and an attenuator pad to the handset receiver and/or speaker. This circuit changes the audio level when the position of the VOLUME switch is varied. SPKR switch S1502 removes speaker LS1501



NOTES:
1. UNLESS OTHERWISE SPECIFIED RESISTORS ARE IN OHMS.
2. TB804 AND TB805 CONNECT TO CONTROL CABLE.

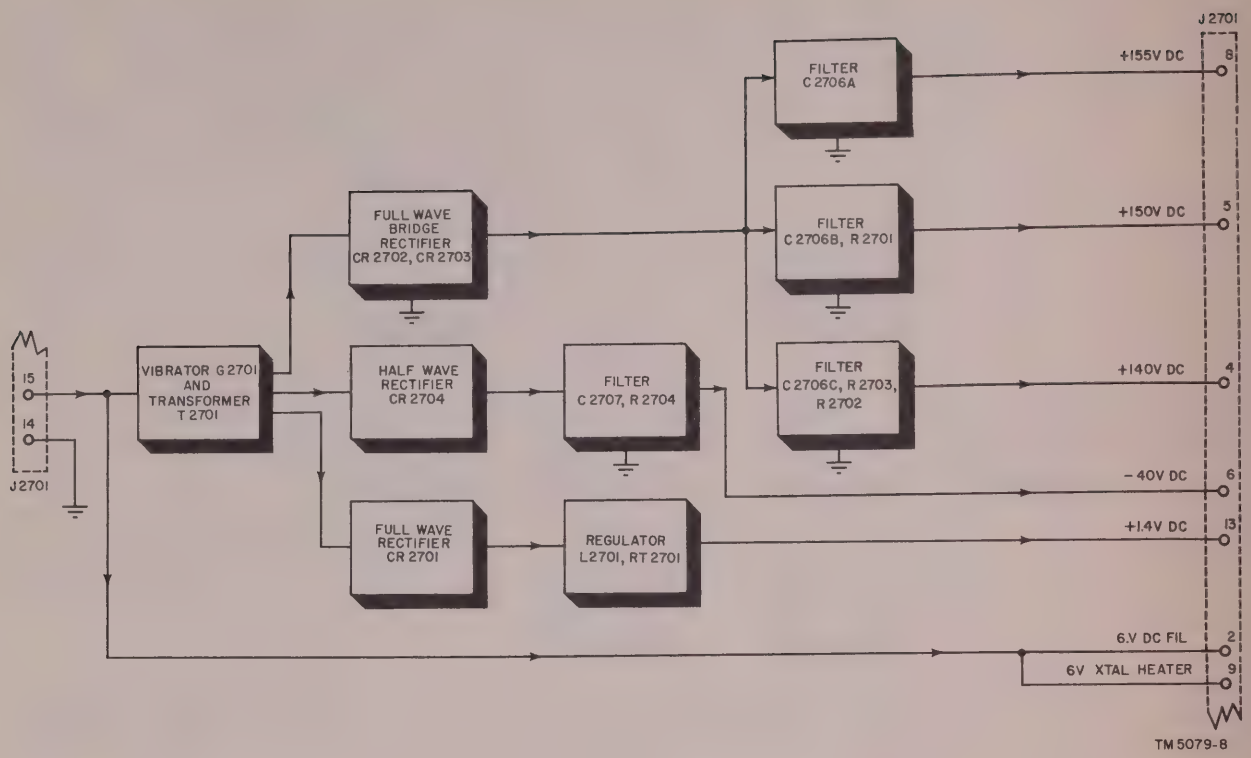


Figure 43. Power Supply PP-867/U functional block diagram.

The second circuit is used to bring the d-c power from the battery source in the vehicle, and contains a fuse (F801) which has a capacity of 50 amperes and which protects the power source. The third circuit consists of a 20-wire cable which connects the cabinet to Radio Set Control C-847/U. The wires in the cable are connected to terminal boards TB804 and TB805 in the cabinet.

68. Theory of Radio Set Control C-847/U

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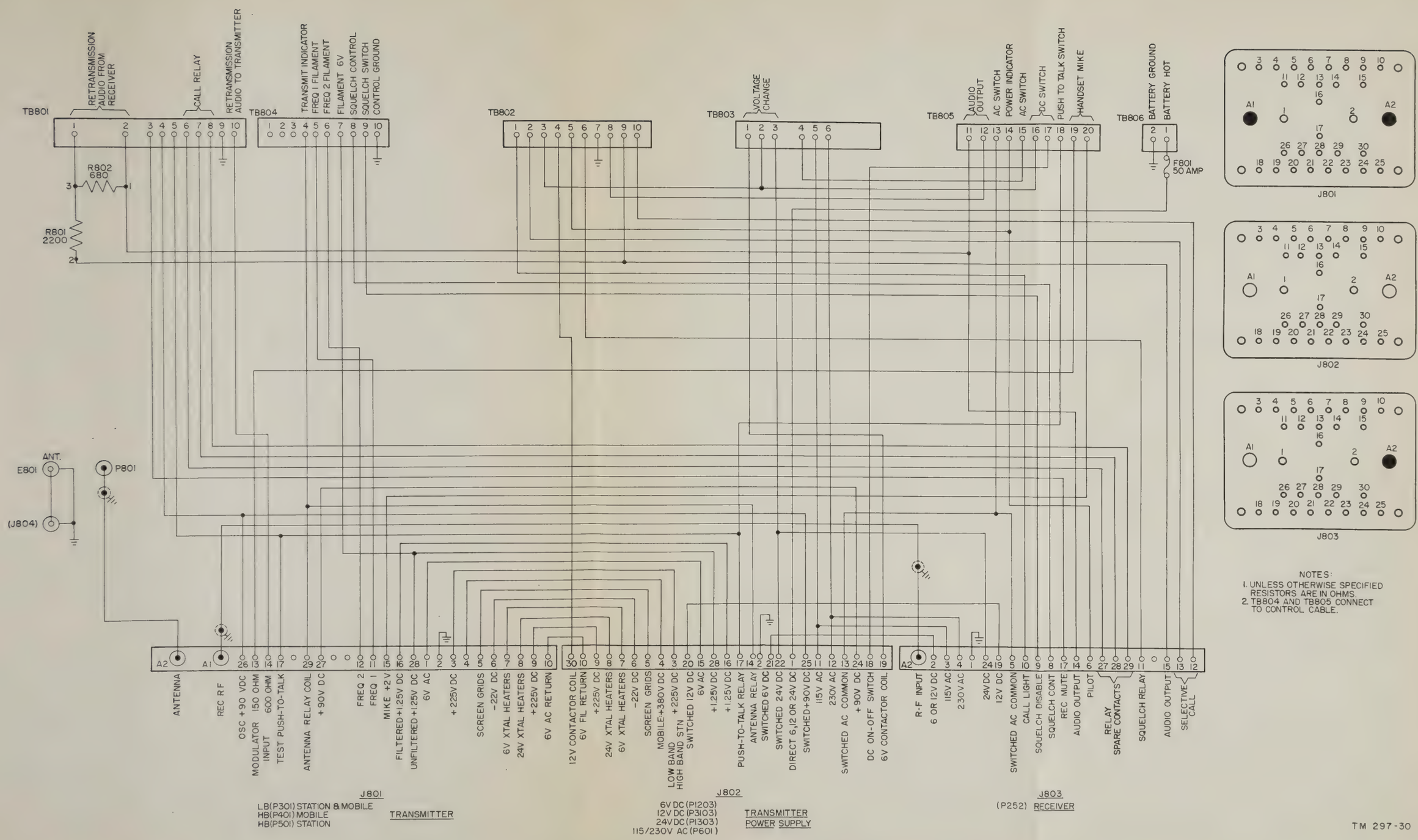


Figure 44. Electrical Equipment Cabinet CY-938/VRC schematic diagram.

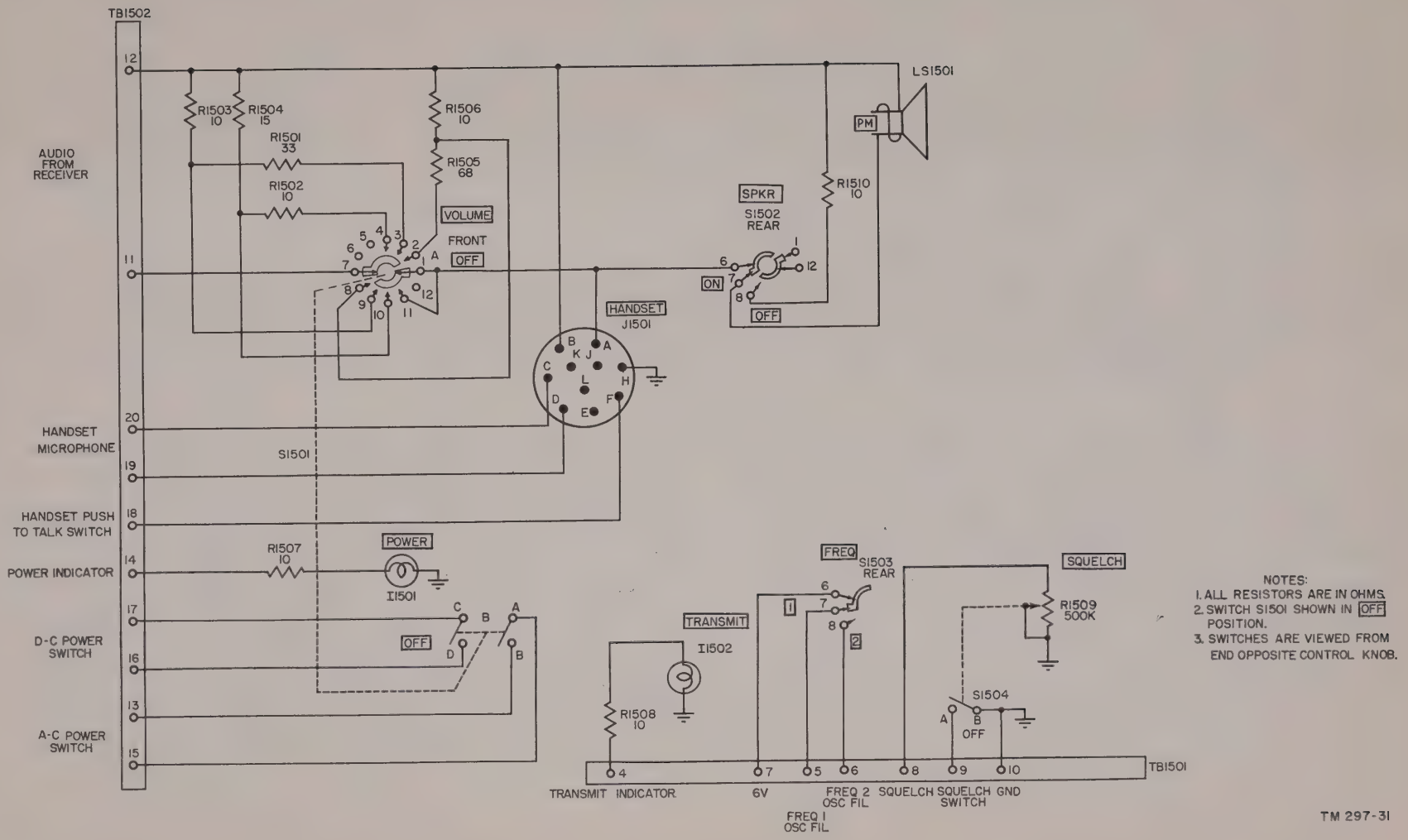


Figure 45. Radio Set Control C-847/U schematic diagram.

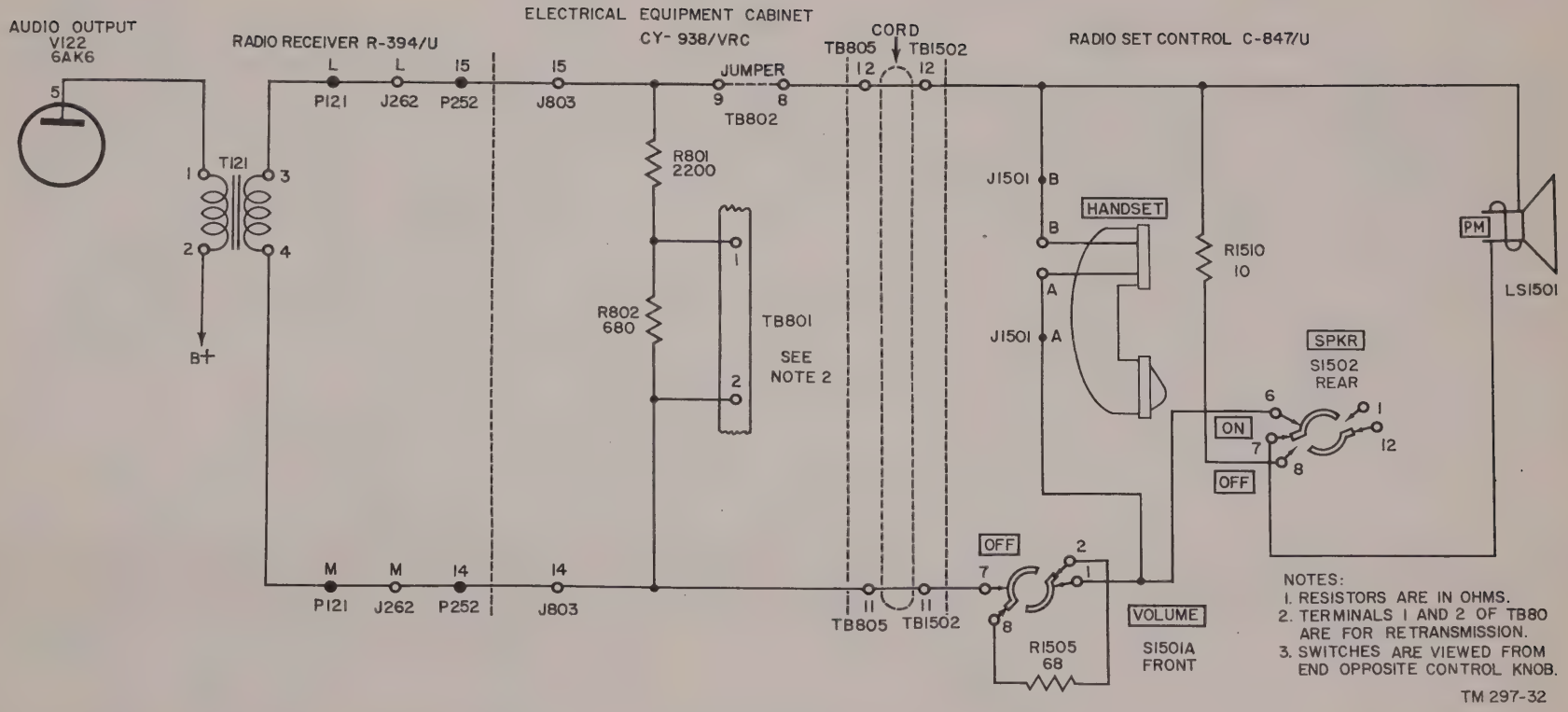


Figure 46. Audio output to handset and speaker, simplified.

from the circuit when it is not being used. Details of these circuits are covered fully in paragraph 69.

(3) Transmitter audio. The output of the handset microphone is taken from the control unit through terminals C and D of J1501 and terminals 19 and 20 of TB1502. Refer to paragraph 70 for more information concerning connections between the microphone and transmitter.

(4) Control. Switch S1503, marked FREQ, is provided to allow the operator to switch between two preset transmitting frequencies. The switch connects filament voltage to the transmitter oscillator tube which is to be used for the desired frequency and removes it from the other oscillator tube. The 6-volt filament voltage is brought into the control at terminals 7 and 10 (ground) of TB1501. The switch then distributes it to one of the two terminals, 5 or 6, depending upon the chosen frequency. When the switch is in the 1 position it is connected to terminal 5 and applies filament voltage to the frequency 1 oscillator filament. In the 2 position the 6-volts are applied through terminal 6 of TB1501 to heat the filament of the frequency 2 oscillator tube. SQUELCH control, R1509 and S1504, is a potentiometer and switch combination. SQUELCH switch, S1504, when closed, disables the squelch circuit by grounding its output circuit thru terminal 9 of TB1501. SQUELCH potentiometer R1509 controls (through terminal 8 of TB1501) the level at which squelching action occurs. As the resistance of the SQUELCH potentiometer is decreased (control turned clockwise), the SQUELCH circuit has less effect in quieting the receiver. A complete explanation of this circuit can be found by referring to the instruction book covering Radio Receiver R-394/U.

(5) Indicators. Two indicator lamps are incorporated in the control. POWER lamp I1501 indicates when power is supplied to the radio set. Resistor R1507 is connected in series with the lamp to limit current through it. The lamp receives its power through terminal 14 of TB1502 and 10 of TB1501 (ground). TRANSMIT lamp I1502 is illuminated when the transmitter is in operation. This lamp also has a current limiting resistor (R1508) in series with it. Power to the lamp is applied through terminals 4 and 10 (ground) of TB1501.

69. Audio Output of Receiver (fig. 46)

a. General. The audio output of the receiver is developed across the secondary of transformer T121 (terminals 3 and 4). From the transformer the signal takes a path through plug-in unit connectors P121 and J262, receiver main connector P252, and through Electrical Equipment Cabinet CY-938/VRC to Radio Set Control C-847/U. At the control it is applied to the handset receiver and/or speaker. SPKR switch S1502 is provided to disconnect the speaker so only the handset receives the audio signal (if desired). The switch is spring loaded and must be held in the OFF position. When the speaker is out of the circuit, it is replaced by 10-ohm resistor R1510, through contacts 6 and 8, in order to keep a constant load on the audio transformer. In Electrical Equipment Cabinet CY-938/VRC, series resistors R801 and R802 are connected across the audio line. These resistors form an attenuator and matching network and are used during retransmission to feed the audio signal to the modulator speech amplifier in the transmitter. The retransmission circuit is described in more detail in paragraph 70. A jumper between terminals 8 and 9 of TB802 permits the audio to be disconnected from the speaker and handset if desired while retransmission is taking place. Resistor R1505 is used in the attenuator circuit discussed in subparagraph b below.

b. Volume Attenuator Circuit (fig. 47). VOLUME switch S1501A has five positions which control the audio level to the handset and/or speaker from zero to full output of the receiver. Zero level is obtained in the OFF position which completely disconnects the audio. In the first position clockwise from OFF, a 10 ohm resistor, R1506, is connected in parallel with the secondary of the audio output transformer. At the same time, 68-ohm resistor R1505 is connected in series with the handset receiver and speaker. This results in the application of approximately 1/8 of the voltage across the secondary of T121 to the speaker and handset. Figure 47 shows the positions of the switch and how the resistors are inserted to adjust the level of the signal. The circuit in A has been discussed above. For the position of S1501A shown in B, the 68-ohm resistor is replaced by 33-ohm resistor R1501. This arrangement raises the level so there is approximately 1/4 of the T121 output voltage across the speaker. In C, the 10-ohm resistor is replaced by resistor R1504 (15 ohms) and the 33-ohm resistor is replaced by 10-ohm resistor R1502. The substitution results in approximately 1/2 of the T121 output voltage being applied to the speaker. The last circuit (D) illustrates a direct connection from the a-f input to the handset and speaker so that there is no reduction in signal strength be-

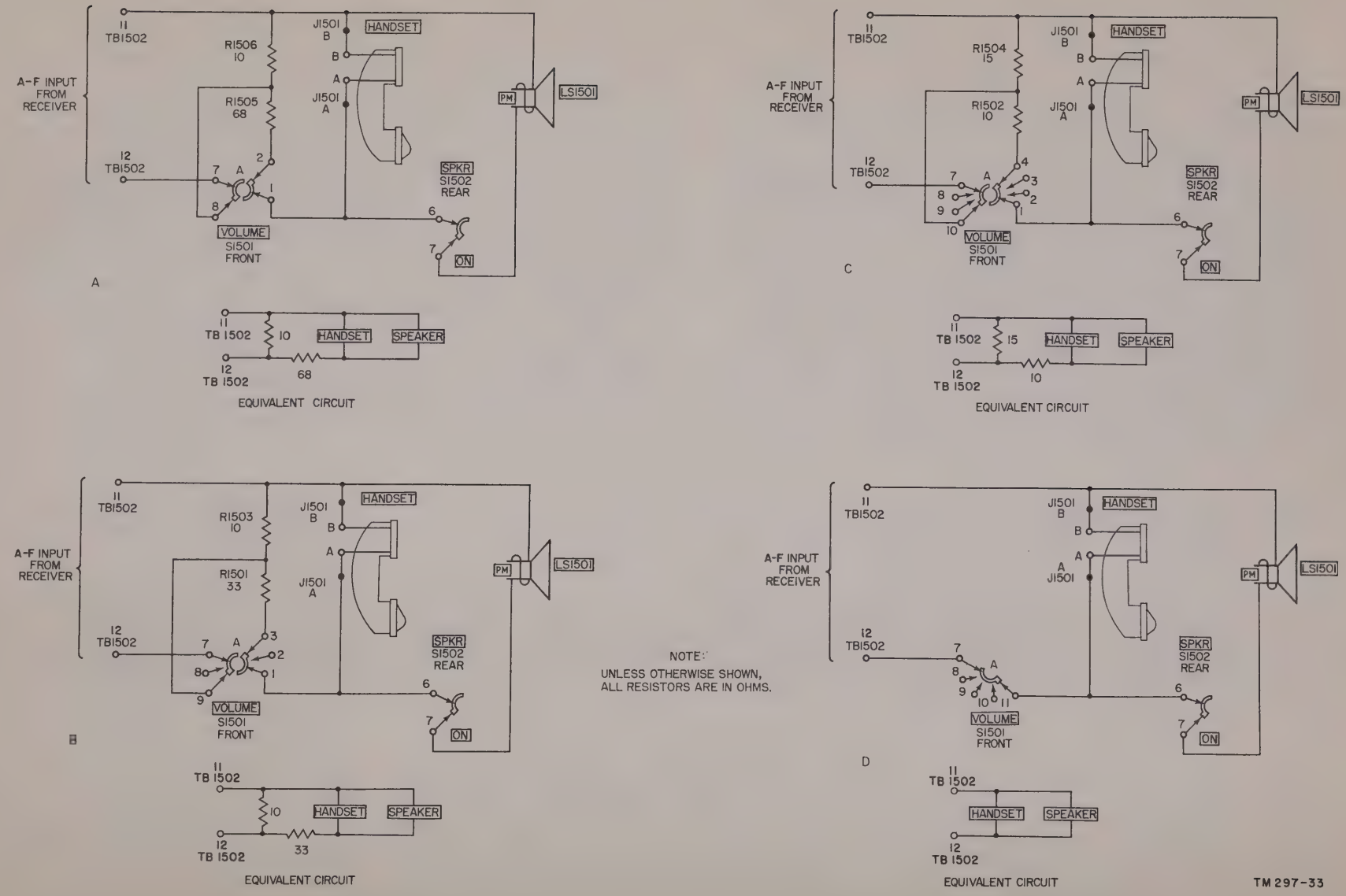


Figure 47. Volume control circuit in Radio Set Control C-847/U, simplified.

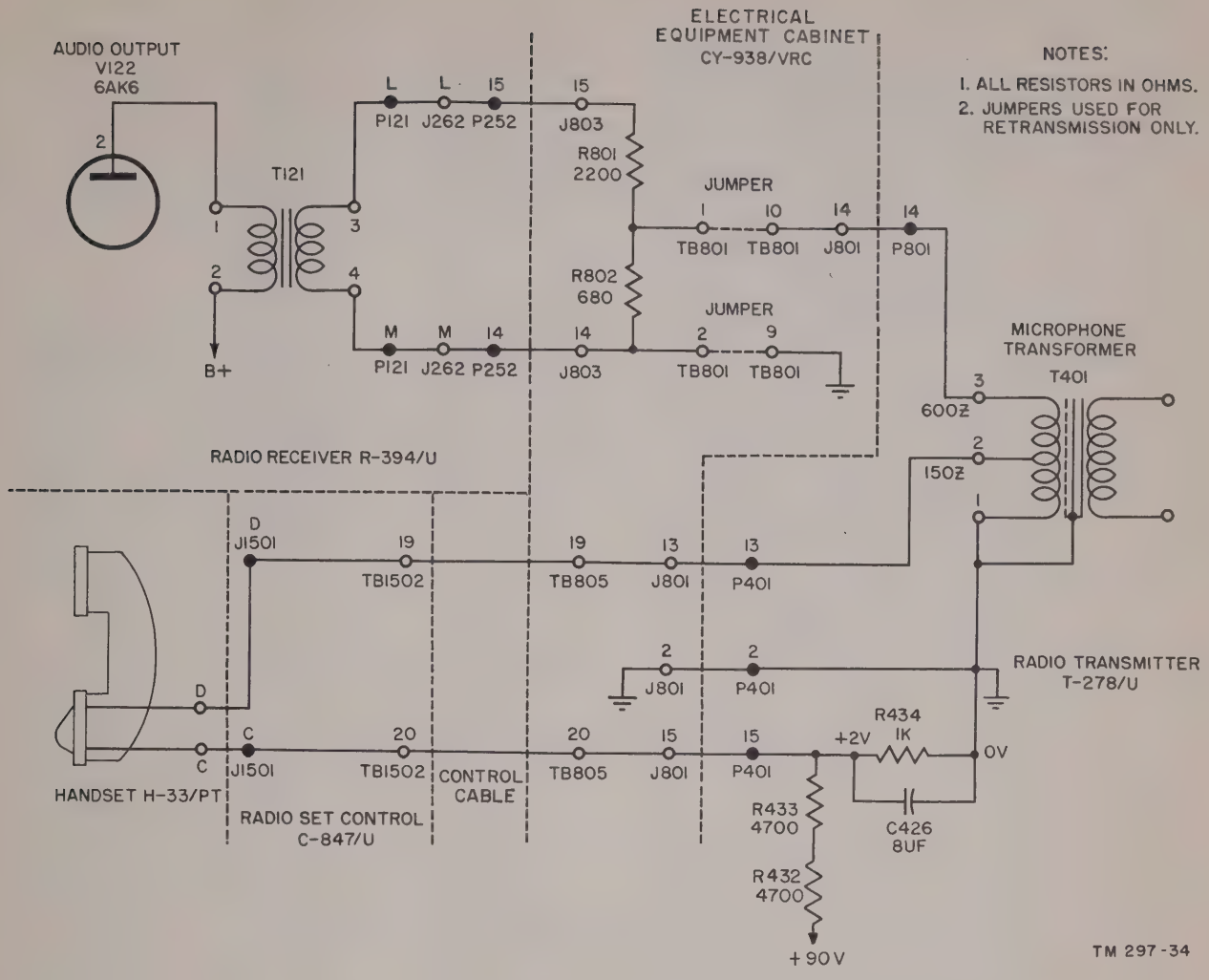


Figure 48. Microphone and retransmission audio circuits.

tween the transformer a-f output and the handset and speaker.

70. Microphone and Retransmission Circuit (fig. 48)

a. Microphone Circuit. Handset H-33/PT contains a carbon type microphone which is connected across the 150-ohm impedance winding (terminals 1 and 3) of transmitter microphone transformer T401. The connection is made to the transmitter through the radio set control, control cable, and Electrical Equipment Cabinet CY-938/VRC. The lower leg of the connection contains a series resistor, R434, which is a part of the transmitter B+ voltage divider located in the transmitter from B+ to ground. The other resistors in the divider are R432 and R433. A 2-volt d-c drop across resistor R434 supplies the necessary current for the microphone circuit. Resistor R434 is bypassed for audio frequencies by capacitor C426.

b. Retransmission Circuit. The retransmission circuit uses the same audio input transformer (T401) in the transmitter but requires a 600-ohm impedance. This impedance is provided across terminals 1 and 3 of the transformer. The output from the receiver audio output transformer T121 is fed through interconnections in the receiver to Electrical Equipment Cabinet CY-938/VRC where it is applied across a series network consisting of resistors R801 and R802. The network is a voltage divider and impedance matching circuit. The portion of the audio signal developed across resistor R802 is applied to the primary of transformer T401 (terminals 1 and 3). Resistor R802 is 680 ohms and, approximately matches the 600 ohm impedance of the transformer. Jumper connections from 1 to 10 and from 2 to 9 of terminal board TB801 permit the retransmission circuit to be disconnected when not needed. The jumper connections are located at the rear of Electrical Equipment Cabinet CY-938/VRC (fig. 21).

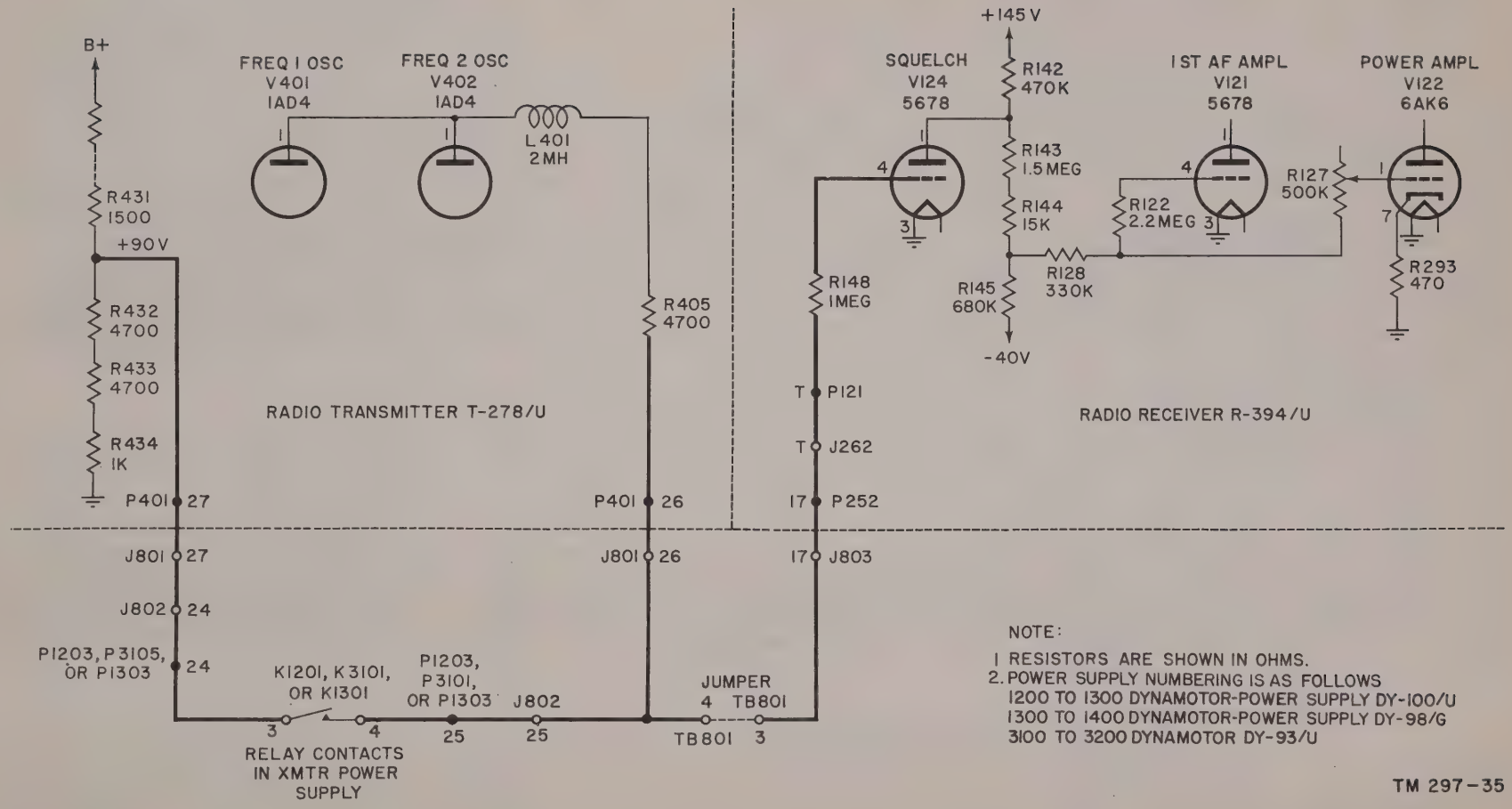


Figure 49. Receiver muting circuit, simplified.

71. Receiver Mute Circuit (fig. 49)

a. When push-to-talk operation is used, the antenna changeover relay (K401) in the transmitter switches the antenna from the receiver input to the transmitter output (fig. 51). The action removes the signal from the receiver except for noise and leakage from the transmitter (if it happens to be transmitting on a nearby frequency). To completely silence the receiver, a receiver muting circuit is used.

b. The circuit is controlled by a relay in the transmitter power supply operated by the push-to-talk switch on the handset. All three transmitter power supplies use contacts 3 and 4 of the relay. A potential of +90 volts is developed across resistors R432, R433, and R434 in the transmitter. It passes through interconnections as shown in figure 50 and to the relay contacts. From the relay it is split into two paths (in the cabinet); one path goes to the plate circuit of transmitter oscillator tubes V401 and V402; the other path goes to the receiver squelch tube (V124) grid.

c. When the power supply relay is closed (push-to-talk switch depressed), the +90 volt potential is applied to the oscillator plate circuit causing it to oscillate. At the same time the potential is applied to the control grid of V124 through current limiting resistor R148. The high positive voltage on the control grid causes the tube to draw a heavier than normal current through its plate load resistor R142. When this happens the voltage at the plate of the tube becomes lower which in turn decreases the potential differences across resistors R143, R144, and R145. One side of resistor R145 is connected to -40 volts. With very little bucking voltage applied from the plate circuit of the squelch tube, the potential at the junction of resistors R144 and R145 approaches -40 volts. This high negative voltage is applied to the control grid circuits of the first audio and power amplifier stages (V121 and V122) through resistor R128. The high negative bias cuts off the audio tubes and effectively mutes the receiver. When the power supply relay contacts open, the transmitter is disabled and the receiver is able to operate. A jumper connection between terminals 3 and 4 of terminal board TB801 permits removal of the muting when desired. It should be removed for retransmission operation (fig. 21).

72. Radio Set AN/VRC-19Y Power and Control Circuits (6 volts)

a. General. The control and low voltage power circuits are shown in figure 50. A 6-volt battery is connected to Electrical Equipment Cabinet CY-938/VRC through a heavy current capacity cable. Either polarity can be connected to the grounded side of the radio set power circuit without affecting any of the low-voltage circuits. The B+ circuit to the transmitter is provided with a means of changing polarity to make the set adaptable to any vehicle polarity (fig. 35.) After the source voltage enters the cabinet, one side is fused by 50-ampere fuse F801 to protect the vehicular power source. From the fuse the current takes two paths, one to power switch S1501B in the radio set control (thru the power supply and the cabinet), and the other to contactor K1202 in the transmitter power supply. On the other side of the line, contact is made with all of the common points that are to be switched into the circuit. Note that a jumper is inserted in the circuit between the power switch and the coil of relay K1203. This connection between terminals 1 and 2 of TB803 is used for the 6-volt radio set only. A second fuse, F1201, (upper left part of fig. 50), is connected in series with the major portion of the circuit. This fuse is located in the transmitter power supply, and protects all of the circuits in the radio set except the dynamotor d-c supply circuit. When the POWER switch is placed in the ON position, relay K1203 is energized, and the battery voltage is applied to all power and control circuits in the radio set except the dynamotor circuit. Contactor K1202 in turn is energized by the closing of K1203 and completes the battery circuit to the dynamotor.

b. Receiver Circuits. Voltage is applied to the receiver power supply through the transmitter power supply, the cabinet, and the receiver proper. (first circuit to right of the contacts of relay K1203 in figure 50). Fuse F2701 in the receiver power supply protects the receiver and receiver power supply. From the fuse, power is applied to a network containing two parallel branches. Contained in the first branch is the receiver crystal oven E31, which receives its power through filter choke L41, and maintains the first high-frequency oscillator crystal at a constant temperature in order to stabilize its frequency. The second branch contains the receiver 6.3-volt tube filaments, V1 and V122, Power indicator I1501, and transformer T2701. Power for I1501 is applied through the receiver, the cabinet, and the radio set control. I1501 indicates that power is applied to the low and high voltage circuits in the receiver, and to the crystal oven in the transmitter. Under certain conditions (subpar. c below) I1501 may also indicate that reduced power is also applied to the transmitter filaments. Voltages for the 1.4-volt receiver filaments and the receiver B+ and bias supplies are developed by secondary windings of transformer T2701 in the receiver power supply. For details on the receiver filament, B+, and bias circuits, see the receiver main schematic (fig. 63) or the instruction book for Radio Receiver R-394/U.

c. Transmitter Power Circuits. In the transmitter, the crystal oven is heated as in the receiver. (Second circuit to right of the contacts of relay K1203 in figure 51). If a jumper is connected from terminal 6 of relay K1201 to resistor R1202 (fourth circuit

to right of the contacts of relay K1203), the transmitter tube filaments will operate continuously, at reduced voltage, as long as the POWER switch is on. Power is applied to the filaments through the jumper, voltage dropping resistors R1202 and R1201, voltage regulator tubes RT1201 and RT1202, and choke L1201 in the transmitter power supply, and through the cabinet. The same power that is applied to the filaments is applied to Freq 1-2 switch S1503, in the radio set control. This switch selects one of two preset transmitter frequencies by controlling the application of filament power to transmitter oscillators V401 and V402. Up to this point the receiver has been placed in operation, the transmitter tubes are heated (if a jumper is correctly connected in the transmitter power supply), and the transmitter crystal oven is operating. The radio set is in a receiving condition and the transmitter is in a stand-by condition.

d. Methods of Transmitter Control. There are two switches and a relay that can initiate the changeover from reception to transmission. They are the push-to-talk switch on the handset, the TEST-OFF switch (S402) on the transmitter, and relay K271. The push-to-talk switch is normally used for routine operation. The TEST switch is used during tuning or alinement, when the transmitter is to be kept on for some time, thereby eliminating the necessity for holding the push-to-talk switch closed. The third method used to place the transmitter in operation is by means of relay K271 located in a modified Radio Receiver R-394/U. This relay is operated by the squelch circuit of the receiver and when properly adjusted will close when the receiver is unsquelched (during reception of a signal). This method is normally used only for retransmission purposes. Jumper connections, in the cabinet and receiver control this operation (pars. 27e and 70).

e. Transmitter Control Circuits. Upon closing the push-to-talk switch, TEST switch, or K271 relay contacts (third circuit to right of the contacts of relay K1203), the ground circuit to the coil of relay K1201 is completed and the relay is energized. This connects power to the transmitter tube filaments through contacts 2 and 7 of the relay, and places the filaments in operation if they haven't already been connected to the power source as described in subparagraph c above. If the filaments have previously been connected to the power source, they will now operate at full voltage instead of reduced voltage. Three circuits are energized through contacts 5 and 6 of the relay. The first circuit contains relay K401 (located in the transmitter) which changes the antenna from the receiver to the transmitter. The second circuit contains TRANSMIT lamp I1502 which is located on the radio set control and indicates that power is applied to the transmitter. Contactor K1202 in the third circuit is energized and connects the vehicular storage battery to the motor section of the dynamotor. The generator section of the dynamotor develops 405 volts which is applied across a voltage divider. The voltages produced by the divider are applied to the transmitter as B+ and bias voltages. For details on the B+ and bias circuits, see the transmitter main schematic (fig. 64) or the instruction book for Radio Transmitter T-278/U. Since all of the filament, bias, and B+ voltages are now applied to the transmitter, it will operate until the push-to-talk switch is released. The mute contacts (3 and 4) of the relay can be connected into the circuit to silence the receiver if noise or leakage from the transmitter is present. The details of this circuit are given in paragraph 71.

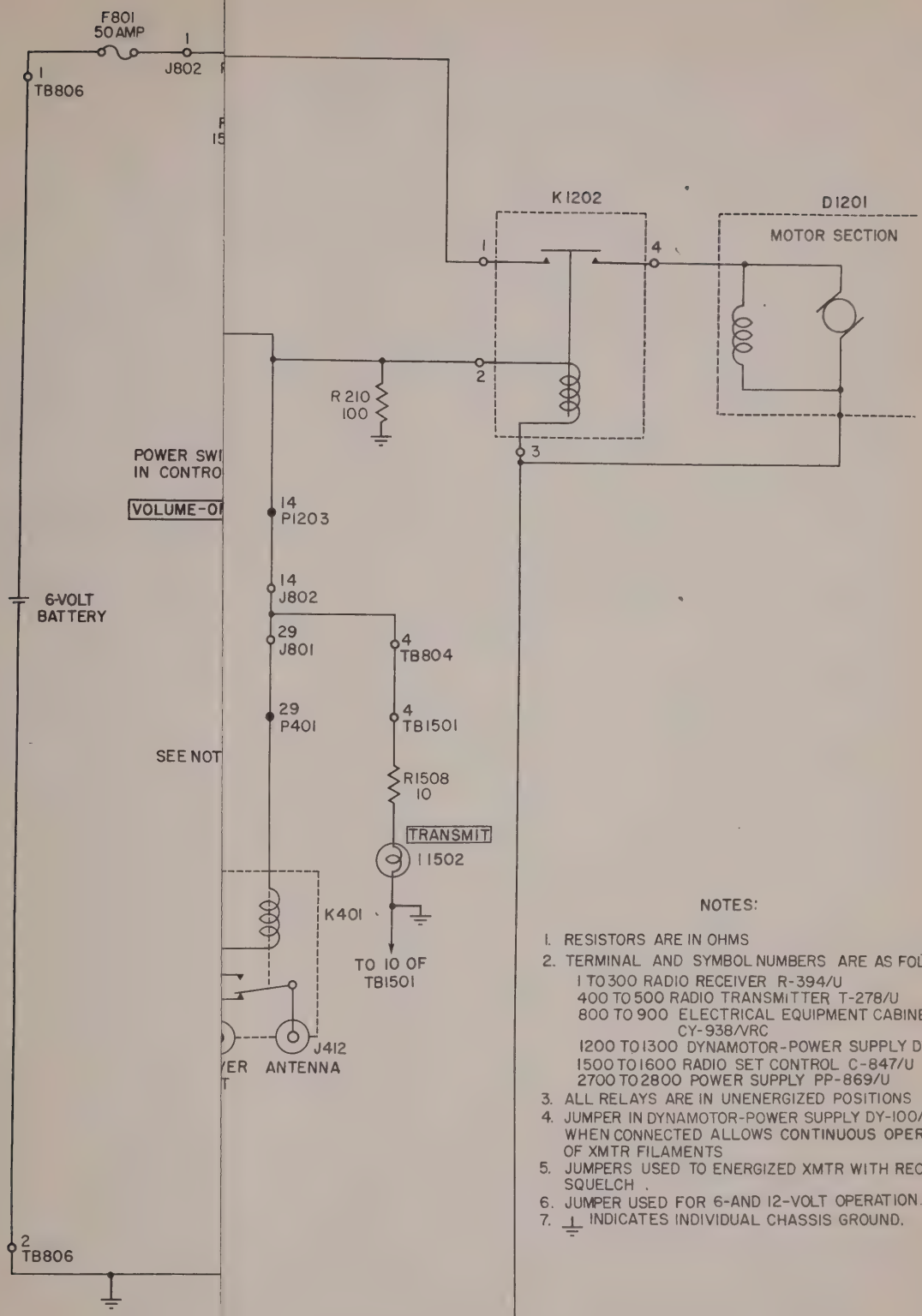
73. Radio Set AN/VRC-19X Power and Control Circuits (12 volts)

a. The power and control circuits of the 12-volt version of the radio set (fig. 51) are almost identical in operation and connection with that of the 6 volt model. The differences between the models are required to reduce the source voltage (12 volts) to the voltage of the basic circuit (6 volts). A comparison of figures 50 and 51 will show the differences between the two radio sets. The differences between the two radio sets are discussed in subparagraph b below.

b. The transmitter oven voltage is dropped 6 volts by resistor R3113. The transmitter tube filaments are kept at their rated voltage by the insertion of resistor R3115. The coils of relays K3101 and K3103 and contactor K3102 are made for 12 volts so they operate directly from the source voltage without dropping resistors. Power for the receiver crystal oven, 6.3-volt tube filaments, and POWER indicator is supplied by a secondary winding of transformer T2801 instead of directly from the power source. In operation, the switching actions are the same as indicated for the 6-volt model.

74. Radio Set AN/VRC-19 Power and Control Circuits (24 volts)

a. The low-voltage circuits of Radio Set AN/VRC-19 are not the same as those used in the other two models but are similar in many respects. In this 24-volt version (fig. 52) a relay is not needed to control the input to the receiver and other control relays since with the same power input as the other two models the set requires much less current. Power switch S1501B in Radio Set Control C-847/U has sufficient current carrying capacity to handle all of the circuits except the dynamotor input. Note that a jumper is connected between terminals 2 and 3 of TB803 (near the right side of the power switch in fig. 52) instead of between



NOTES:

1. RESISTORS ARE IN OHMS
2. TERMINAL AND SYMBOL NUMBERS ARE AS FOLLOWS:
   1 TO 300 RADIO RECEIVER R-394/U
   400 TO 500 RADIO TRANSMITTER T-278/U
   800 TO 900 ELECTRICAL EQUIPMENT CABINET CY-938/VRC
   1200 TO 1300 DYNAMOTOR-POWER SUPPLY DY-100/U
   1500 TO 1600 RADIO SET CONTROL C-847/U
   2700 TO 2800 POWER SUPPLY PP-869/U
3. ALL RELAYS ARE IN UNENERGIZED POSITIONS
4. JUMPER IN DYNAMOTOR-POWER SUPPLY DY-100/U WHEN CONNECTED ALLOWS CONTINUOUS OPERATION OF XMTR FILAMENTS
5. JUMPERS USED TO ENERGIZED XMTR WITH RECEIVE SQUELCH .
6. JUMPER USED FOR 6-AND 12-VOLT OPERATION.
7. ⏚ INDICATES INDIVIDUAL CHASSIS GROUND.

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to right of the contacts of relay K1203), the transmitter tube filaments will operate continuously, at reduced voltage, as long as the POWER switch is on. Power is applied to the filaments through the jumper, voltage dropping resistors R1202 and R1201, voltage regulator tubes RT1201 and RT1202, and choke L1201 in the transmitter power supply, and through the cabinet. The same power that is applied to the filaments is applied to Freq 1-2 switch S1503, in the radio set control. This switch selects one of two preset transmitter frequencies by controlling the application of filament power to transmitter oscillators V401 and V402. Up to this point the receiver has been placed in operation, the transmitter tubes are heated (if a jumper is correctly connected in the transmitter power supply), and the transmitter crystal oven is operating. The radio set is in a receiving condition and the transmitter is in a stand-by condition.

d. Methods of Transmitter Control. There are two switches and a relay that can initiate the changeover from reception to transmission. They are the push-to-talk switch on the handset, the TEST-OFF switch (S402) on the transmitter, and relay K271. The push-to-talk switch is normally used for routine operation. The TEST switch is used during tuning or alinement, when the transmitter is to be kept on for some time, thereby eliminating the necessity for holding the push-to-talk switch closed. The third method used to place the transmitter in operation is by means of relay K271 located in a modified Radio Receiver R-394/U. This relay is operated by the squelch circuit of the receiver and when properly adjusted will close when the receiver is unsquelched (during reception of a signal). This method is normally used only for retransmission purposes. Jumper connections, in the cabinet and receiver control this operation (pars. 27e and 70).

e. Transmitter Control Circuits. Upon closing the push-to-talk switch, TEST switch, or K271 relay contacts (third circuit to right of the contacts of relay K1203), the ground circuit to the coil of relay K1201 is completed and the relay is energized. This connects power to the transmitter tube filaments through contacts 2 and 7 of the relay, and places the filaments in operation if they haven't already been connected to the power source as described in subparagraph c above. If the filaments have previously been connected to the power source, they will now operate at full voltage instead of reduced voltage. Three circuits are energized through contacts 5 and 6 of the relay. The first circuit contains relay K401 (located in the transmitter) which changes the antenna from the receiver to the transmitter. The second circuit contains TRANSMIT lamp I1502 which is located on the radio set control and indicates that power is applied to the transmitter. Contactor K1202 in the third circuit is energized and connects the vehicular storage battery to the motor section of the dynamotor. The generator section of the dynamotor develops 405 volts which is applied across a voltage divider. The voltages produced by the divider are applied to the transmitter as B+ and bias voltages. For details on the B+ and bias circuits, see the transmitter main schematic (fig. 64) or the instruction book for Radio Transmitter T-278/U. Since all of the filament, bias, and B+ voltages are now applied to the transmitter, it will operate until the push-to-talk switch is released. The mute contacts (3 and 4) of the relay can be connected into the circuit to silence the receiver if noise or leakage from the transmitter is present. The details of this circuit are given in paragraph 71.

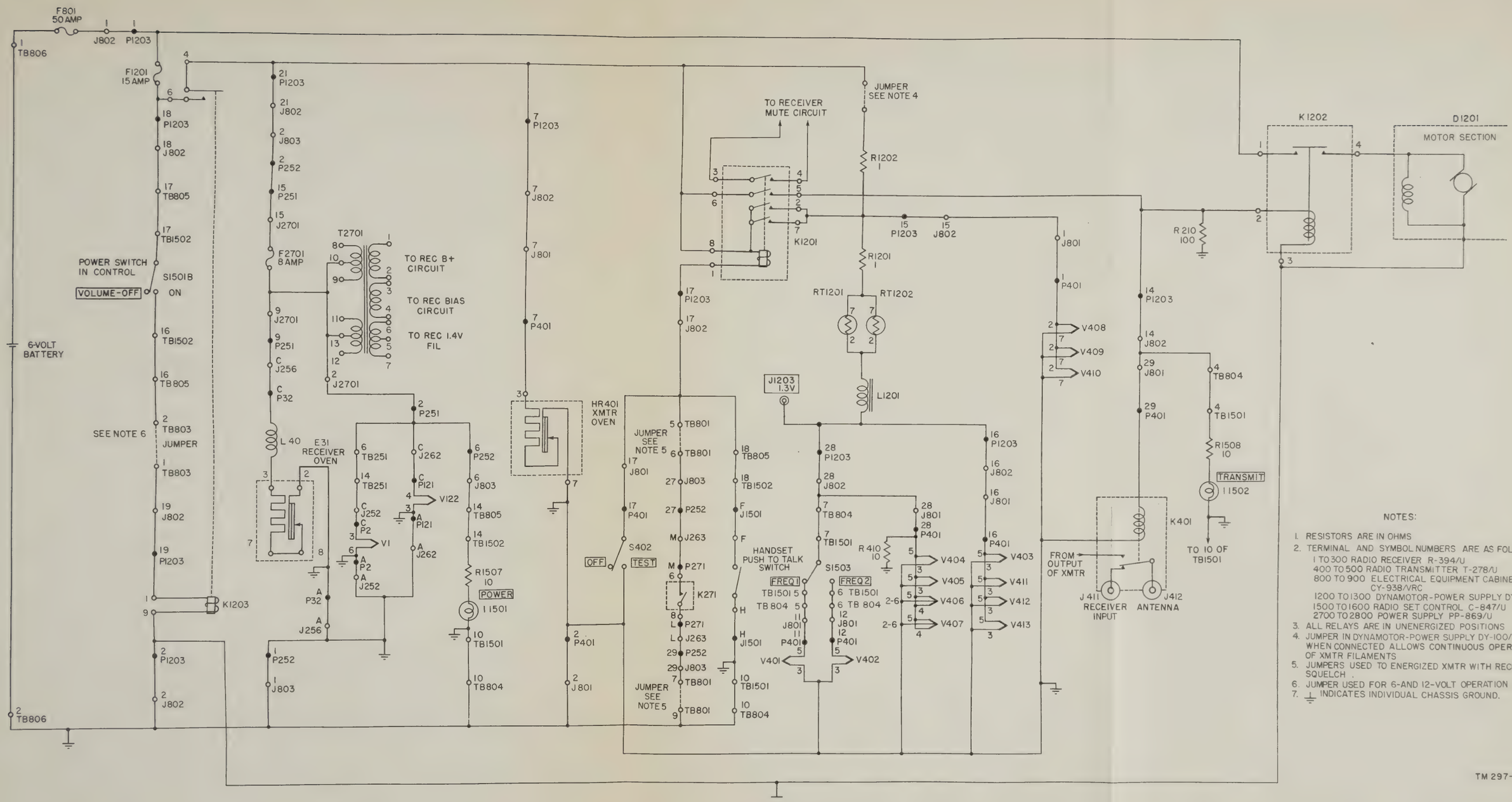
73. Radio Set AN/VRC-19X Power and Control Circuits (12 volts)

a. The power and control circuits of the 12-volt version of the radio set (fig. 51) are almost identical in operation and connection with that of the 6 volt model. The differences between the models are required to reduce the source voltage (12 volts) to the voltage of the basic circuit (6 volts). A comparison of figures 50 and 51 will show the differences between the two radio sets. The differences between the two radio sets are discussed in subparagraph b below.

b. The transmitter oven voltage is dropped 6 volts by resistor R3113. The transmitter tube filaments are kept at their rated voltage by the insertion of resistor R3115. The coils of relays K3101 and K3103 and contactor K3102 are made for 12 volts so they operate directly from the source voltage without dropping resistors. Power for the receiver crystal oven, 6.3-volt tube filaments, and POWER indicator is supplied by a secondary winding of transformer T2801 instead of directly from the power source. In operation, the switching actions are the same as indicated for the 6-volt model.

74. Radio Set AN/VRC-19 Power and Control Circuits (24 volts)

a. The low-voltage circuits of Radio Set AN/VRC-19 are not the same as those used in the other two models but are similar in many respects. In this 24-volt version (fig. 52) a relay is not needed to control the input to the receiver and other control relays since with the same power input as the other two models the set requires much less current. Power switch S1501B in Radio Set Control C-847/U has sufficient current carrying capacity to handle all of the circuits except the dynamotor input. Note that a jumper is connected between terminals 2 and 3 of TB803 (near the right side of the power switch in fig. 52) instead of between



NOTES:

1. RESISTORS ARE IN OHMS
2. TERMINAL AND SYMBOL NUMBERS ARE AS FOLLOWS
   1 TO 300 RADIO RECEIVER R-394/U
   400 TO 500 RADIO TRANSMITTER T-278/U
   800 TO 900 ELECTRICAL EQUIPMENT CABINET CY-938/VRC
   1200 TO 1300 DYNAMOTOR-POWER SUPPLY DY-100/U
   1500 TO 1600 RADIO SET CONTROL C-847/U
   2700 TO 2800 POWER SUPPLY PP-869/U
3. ALL RELAYS ARE IN UNENERGIZED POSITIONS
4. JUMPER IN DYNAMOTOR-POWER SUPPLY DY-100/U WHEN CONNECTED ALLOWS CONTINUOUS OPERATION OF XMTR FILAMENTS
5. JUMPERS USED TO ENERGIZED XMTR WITH RECEIVE SQUELCH .
6. JUMPER USED FOR 6-AND 12-VOLT OPERATION
7. ⏚ INDICATES INDIVIDUAL CHASSIS GROUND.

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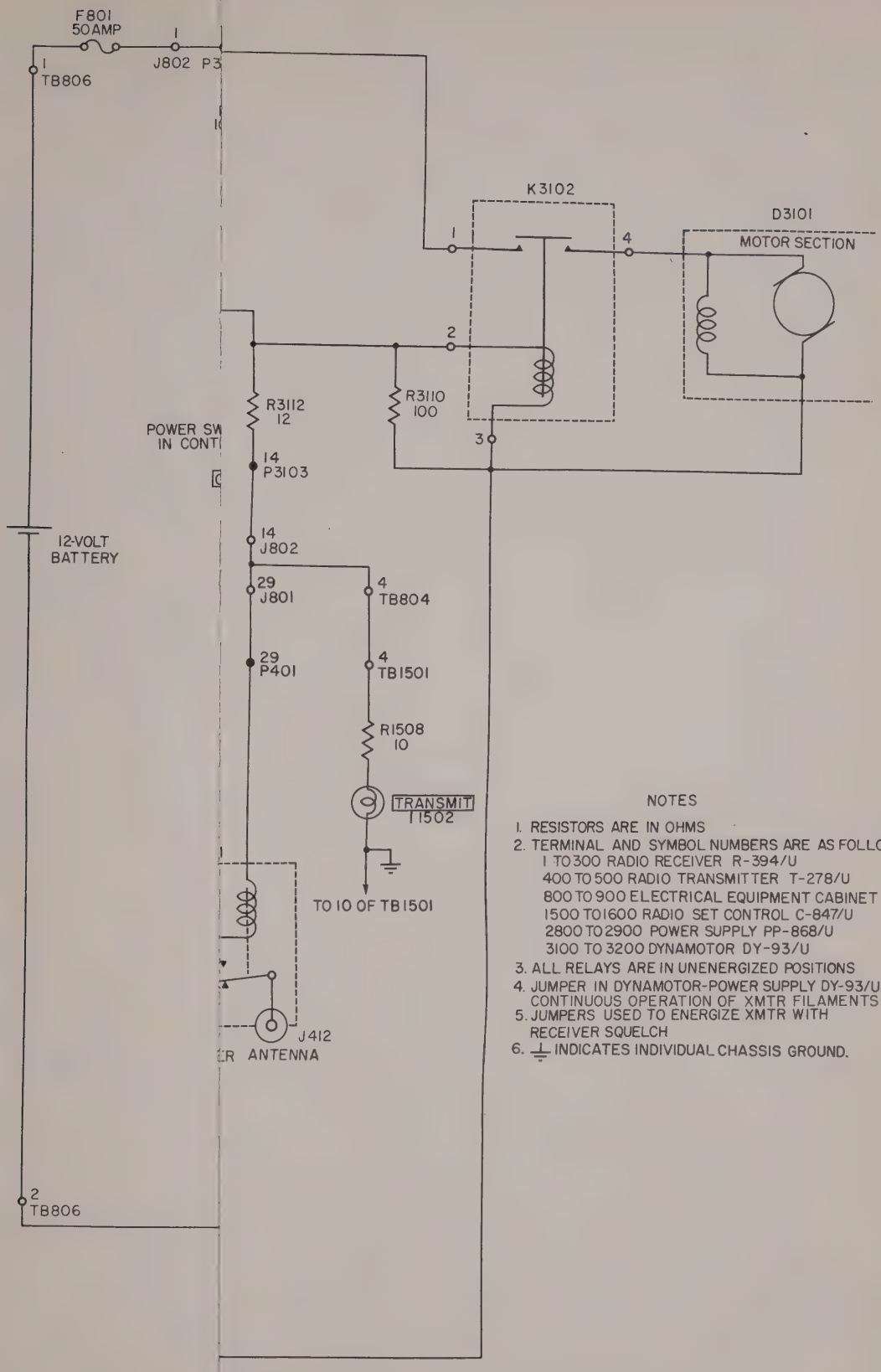
Figure 50. Radio Set AN/VRC-19Y (6-volt) power and control circuits.



NOTES

1. RESISTORS ARE IN OHMS
2. TERMINAL AND SYMBOL NUMBERS ARE AS FOLLOWS:
   1 TO 300 RADIO RECEIVER R-394/U
   400 TO 500 RADIO TRANSMITTER T-278/U
   800 TO 900 ELECTRICAL EQUIPMENT CABINET CY-938/VRC
   1500 TO 1600 RADIO SET CONTROL C-847/U
   2800 TO 2900 POWER SUPPLY PP-868/U
   3100 TO 3200 DYNAMOTOR DY-93/U
3. ALL RELAYS ARE IN UNENERGIZED POSITIONS
4. JUMPER IN DYNAMOTOR-POWER SUPPLY DY-93/U CONTINUOUS OPERATION OF XMTR FILAMENTS
5. JUMPERS USED TO ENERGIZE XMTR WITH RECEIVER SQUELCH
6. ⏚ INDICATES INDIVIDUAL CHASSIS GROUND.

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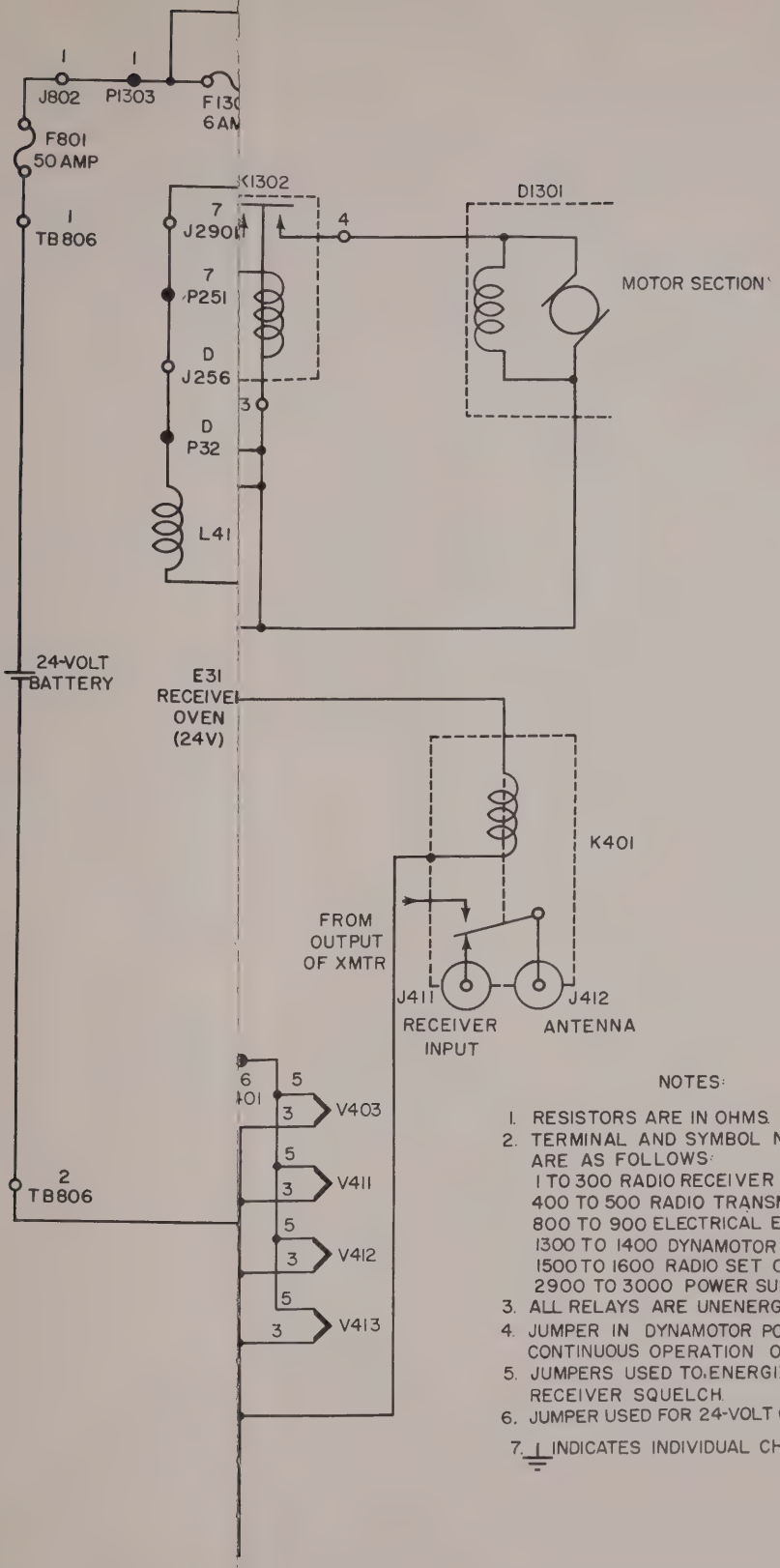

NOTES:

1. RESISTORS ARE IN OHMS.
2. TERMINAL AND SYMBOL NUMBERS ARE AS FOLLOWS:
   1 TO 300 RADIO RECEIVER R-394/U
   400 TO 500 RADIO TRANSMITTER T-278/U
   800 TO 900 ELECTRICAL EQUIPMENT CABINET CY-938/VRC
   1300 TO 1400 DYNAMOTOR POWER SUPPLY DY-98/G
   1500 TO 1600 RADIO SET CONTROL C-847/U
   2900 TO 3000 POWER SUPPLY PP-867/U
3. ALL RELAYS ARE UNENERGIZED POSITIONS.
4. JUMPER IN DYNAMOTOR POWER SUPPLY DY-98/G ALLOWS CONTINUOUS OPERATION OF XMTR FILAMENTS.
5. JUMPERS USED TO ENERGIZE XMTR WITH RECEIVER SQUELCH.
6. JUMPER USED FOR 24-VOLT OPERATION ONLY.
7. ⏚ INDICATES INDIVIDUAL CHASSIS GROUND.

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NOTES

1. RESISTORS ARE IN OHMS
2. TERMINAL AND SYMBOL NUMBERS ARE AS FOLLOWS
   1 TO 300 RADIO RECEIVER R-394/U
   400 TO 500 RADIO TRANSMITTER T-278/U
   800 TO 900 ELECTRICAL EQUIPMENT CABINET CY-938/VRC
   1500 TO 1600 RADIO SET CONTROL C-847/U
   2800 TO 2900 POWER SUPPLY PP-868/U
   3100 TO 3200 DYNAMOTOR DY-93/U
3. ALL RELAYS ARE IN UNENERGIZED POSITIONS
4. JUMPER IN DYNAMOTOR-POWER SUPPLY DY-93/U CONTINUOUS OPERATION OF XMTR FILAMENTS
5. JUMPERS USED TO ENERGIZE XMTR WITH RECEIVER SQUELCH
6. ⏚ INDICATES INDIVIDUAL CHASSIS GROUND.

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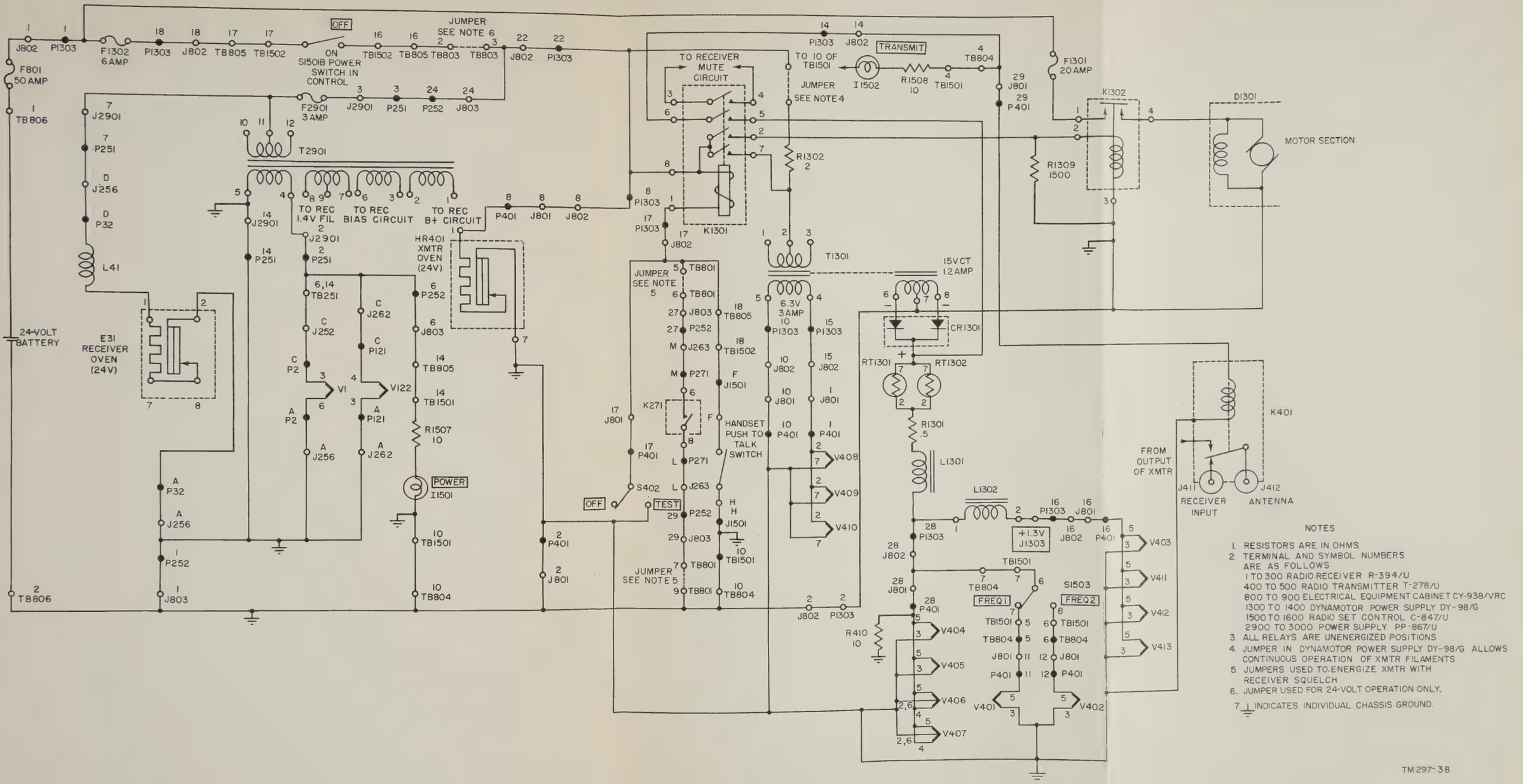
Figure 51. Radio Set AN/VRC-19X (12-volt) power and control circuits.



NOTES

1. RESISTORS ARE IN OHMS.
2. TERMINAL AND SYMBOL NUMBERS ARE AS FOLLOWS
   1 TO 300 RADIO RECEIVER R-394/U
   400 TO 500 RADIO TRANSMITTER T-278/U
   800 TO 900 ELECTRICAL EQUIPMENT CABINET CY-938/VRC
   1300 TO 1400 DYNAMOTOR POWER SUPPLY DY-98/G
   1500 TO 1600 RADIO SET CONTROL C-847/U
   2900 TO 3000 POWER SUPPLY PP-867/U
3. ALL RELAYS ARE UNENERGIZED POSITIONS
4. JUMPER IN DYNAMOTOR POWER SUPPLY DY-98/G ALLOWS CONTINUOUS OPERATION OF XMTR FILAMENTS
5. JUMPERS USED TO ENERGIZE XMTR WITH RECEIVER SQUELCH
6. JUMPER USED FOR 24-VOLT OPERATION ONLY.
7. ⏚ INDICATES INDIVIDUAL CHASSIS GROUND.

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Figure 52. Radio Set AN/VRC-19 (24-volt) power and control circuits.

terminals 1 and 2 of TB803 or terminals 3 and 4 of TB802 as in the other two sets. This connection makes it possible to use the power switch for the circuits which were connected to either relay K3103 or K1203 in the other two sets.

b. Crystal oven heaters E31 and HR401 are operated directly from the 24-volt source. These ovens have elements that are capable of operating on either 6 or 24 volts if properly connected. The connections are automatically made when the correct power supplies are used. In the transmitter, all of the tube filaments receive their voltages from the secondary windings of power transformer T1301 instead of directly from the power source. The voltage developed in one secondary winding is applied directly to the 6.3-volt filaments; the voltage developed in the other secondary winding is rectified and filtered before it is applied to the 1.3-volt filaments. A fuse, F1301, is provided for dynamotor D1301. Operation of the relays and switches are the same as for the 6- and 12-volt models.

CHAPTER 5

FIELD MAINTENANCE INSTRUCTIONS

Section I. TROUBLE SHOOTING AT FIELD MAINTENANCE LEVEL

Note: This chapter contains information for field maintenance. The amount of repair that can be performed by units having field maintenance responsibility is limited only by the tools and test equipment available and by the skill of the repairman.

Warning: When servicing Radio Set AN/VRC-19(*) be extremely careful because of exposure to high voltage. Voltages as high as 400 volts are present at certain points in Radio Transmitter T-278/U and its associated power supply. It is also possible to come in contact with these high voltages when the rear cover of Electrical Equipment Cabinet CY-938/VRC is off. Be sure that all power is turned off before touching any of the high-voltage connections. Read the caution notice in the instruction books before attempting repairs.

75. Scope

This chapter contains general field maintenance procedure for system trouble shooting and detailed field maintenance instructions for Electrical Equipment Cabinet CY-938/VRC and Radio Set Control C-847/U. Consult the following publications for detailed information related to the maintenance of the other radio set components.

Component	Publication
Radio Transmitter T-278/U	Transmitter instruction book.
Radio Receiver R-394/U	Receiver instruction book.
Dynamotor-Power Supply DY-100/U, Dynamotor Dy-93/U, and Dynamotor-Power Supply DY-98/G	D-c transmitter power supply instruction book.
Power Supplies PP-867/U, PP-868/U, and PP-869/U	D-c receiver power supply instruction book.

76. Trouble Shooting Procedures

The first step in servicing a defective radio set is to sectionalize the fault. Sectionalization means tracing the fault to the major component or circuit responsible for the abnormal operation of the set. The second step is to localize the fault. Localization means tracing the fault to the defective part responsible for the abnormal conditions. Some faults such as burned-out resistors, r-f arcing, and shorted transformers often can be located by sight, smell, and hearing. The majority of faults, however, must be localized by checking voltage and resistance.

a. System Sectionalization. Radio Set AN/VRC-19(*) should be set up for operation following the steps given in the starting procedure. Check operation of the component against the equipment performance checklist, until an abnormal indication is noted. This often will indicate the unit at fault. A voltage and resistance diagram (fig. 66) for Electrical Equipment Cabinet CY-938/VRC, with all units connected, has been provided as an additional aid to sectionalization.

b. Localization. Localization of trouble within a component of Radio Set AN/VRC-19(*) may be accomplished by following instructions in the individual instruction books.

77. Trouble Shooting Data

Take advantage of the material supplied in this instruction book. It will help in the rapid sectionalization of faults. Diagrams showing the connections of the system, control circuits of the power source, and schematic diagrams of each unit are provided in addition to those which will be found in the individual instruction books. By tracing the key circuits through switches, terminal boards, and cables, troubles can usually be found very readily. During the trouble shooting procedures it may be helpful to consult chapter 4, for circuit theory to more rapidly locate the trouble and prevent unnecessary work. Consult the trouble shooting data in the component instruction books and the following illustrations in this instruction book:

77. Trouble Shooting Data (contd)

Fig. or Par. No.	Description
Fig. 21	Connections for Radio Set AN/VRC-19(*).
Fig. 22	Front panel of Radio Set Control C-847/U.
Fig. 23	Front panel of Radio Transmitter T-278/U.
Fig. 24	Radio Receiver R-394/U, front panel test points.
Fig. 25	Transmitter power supply, front panel test points.
Fig. 32	Interior view of Electrical Equipment Cabinet CY-938/VRC showing fuse location.
Fig. 33	Radio Transmitter T-278/U, tube location.
Fig. 34	Radio Receiver R-394/U, tube location.
Fig. 35	Transmitter power supply, fuse and vibrator location.
Fig. 36	Receiver power supply, fuse and vibrator location.
Fig. 46	Electrical Equipment Cabinet CY-938/VRC, schematic diagram.
Fig. 47	Radio Set Control C-847/U, schematic diagram.
Fig. 50	Radio Set AN/VRC-19Y, power and control circuits (6 volts).
Fig. 51	Radio Set AN/VRC-19X, power and control circuits (12 volts).
Fig. 52	Radio Set AN/VRC-19, power and control circuits (24 volts).
Fig. 55	Resistor color codes.
Fig. 56	Capacitor color codes.
Fig. 57	Dynamotor-Power Supply DY-100/U, schematic diagram.
Fig. 58	Dynamotor DY-93/U, schematic diagram.
Fig. 59	Dynamotor -Power Supply DY-98/G, schematic diagram.
Fig. 60	Power Supply PP-869/U, schematic diagram.
Fig. 61	Power Supply PP-868/U, schematic diagram.
Fig. 62	Power Supply PP-867/U, schematic diagram.
Fig. 63	Radio Receiver R-394/U, schematic diagram.
Fig. 64	Radio Transmitter T-278/U, schematic diagram.
Fig. 65	Electrical Equipment Cabinet CY-938/VRC wiring diagram.
Fig. 66	Electrical Equipment Cabinet CY-938/VRC, voltage and resistance diagram.

Section II. TROUBLE SHOOTING RADIO SET CONTROL C-847/U AND ELECTRICAL EQUIPMENT CABINET CY-938/VRC

78. Test Equipment Required

Electronic Multimeter TS-505/U can be used for trouble shooting Radio Set Control C-847/U and Electrical Equipment Cabinet CY-938/VRC. Instructions for the use of this meter are contained in TM 11-5511.

79. Localizing Trouble

After the trouble has been sectionalized to Radio Set Control C-847/U or Electrical Equipment Cabinet CY-938/VRC the defective item can be determined from the trouble shooting charts (pars. 80 and 81). Check to see that all cable connections from Radio Set Control C-847/U to Electrical Equipment Cabinet CY-938/VRC are correct and that all control settings are in the proper position for normal operation. When checking the possible defective item listed in the trouble shooting chart always check for defective wiring. Refer to figs. 32, 53, and 54 for identification of the components.

80. Trouble Shooting Chart for Radio Set Control C-847/U

Symptoms	Probable trouble	Correction
1. POWER indicator does not light, there is no output from the speaker to indicate that the receiver is operating.	1. Defective connection to terminal strip TB1502.	1. Check connections and correct.
	Defective switch S1501B.	Check for burned contacts or damaged wiring.
	Defective POWER indicator lamp or dropping resistor (R1507).	Replace defective lamp or resistor.
2. No audio output from speaker or handset.	2. SQUELCH control R1509 turned all the way clockwise.	2. Place control in correct position.
	Defective wires or connections to 11 and 12 of TB1502.	Check connections.
	Defective reistor in VOLUME switch S1501A circuit.	Replace defective resistor.
	Defective VOLUME switch S1501A.	Replace defective switch.
3. Output from handset, but no output from speaker.	3. Defective SPKR switch S1502.	3. Check switch or replace if necessary.
	Defective speaker, LS1501.	Replace defective speaker.
4. Output from speaker but no output from handset.	4. Defective Handset H-33/PT.	4. Replace handset.
5. Handset H-33/PT switch is depressed, but transmitter does not transmit.	5. Defective Handset H-33/PT or poor connection at terminal 18 of TB1502.	5. Replace handset and check connections.
6. Transmitter operates but TRANSMIT indicator does not light.	6. Defective indicator lamp I1502 or resistor R1508.	6. Replace defective indicator lamp or resistor.
	Poor connection at terminal 4 of TB1501	Check connections.
7. Transmitter operates on one frequency, but when FREQ. switch is changed to alternate position transmitter does not function.	7. Defective switch S1503.	7. Replace switch.
	Poor connections at terminal 5, 6, or 7 of TB1501.	Check for reversed leads or loose contact.

80. Trouble Shooting Chart for Radio Set Control C-847/U (contd)

Symptoms	Probable trouble	Correction
8. Receiver will not SQUELCH.	8. Defective SQUELCH potentiometer R1509 or SQUELCH switch S1504 is shorted.	8. Check potentiometer and switch and replace if defective.
9. Transmitter operates but cannot be modulated.	9. Defective Handset H-33/PT.	9. Replace handset.
	Connections to terminals 19 and 20 not tight.	Check connections.
10. VOLUME of speaker and handset cannot be adjusted on any position, or can be adjusted only on certain positions.	10. Defective VOLUME switch S1501A or resistors R1501 through R1506.	10. Replace defective component.

81. Trouble Shooting Chart for Electrical Equipment Cabinet CY-938/VRC

Symptoms	Probable trouble	Correction
1. Radio Set AN/VRC-19(*) is inoperative.	1. Fuse F801 defective.	1. Replace defective fuse.
	Jumper between terminals 1 and 2 (6-volt model) or 2 and 3 (24-volt model) of TB803 or between 3 and 4 of TB802 (12-volt model) not correctly wired or loose.	Check jumper connections.
2. Receiver operates but Power indicator does light.	2. Improper or loose connections at terminal 14 of TB805.	2. Check connections.
3. Transmitter oven operates but the dynamotor and the transmit power supply will not operate.	3. Improper connections at terminal 18 of TB805.	3. Check connections. Place the test switch in the transmitter in the test position to confirm whether trouble is in the cabinet or in the Transmitter power supply. If the transmitter operates with the switch closed, the circuit to the handset push-to-talk switch is open.

Symptoms	Probable trouble	Correction
4. The transmitter operates but the TRANSMIT indicator does not light.	4. Improper or loose connections at terminal 4 of TB804.	4. Check connections.
5. Transmitter operates on one frequency only.	5. Improper or loose connections at terminals 5, 6, or 7 of TB804.	5. Check for reversed leads or loose contact.
6. Receiver operates as if weak signal is being received. Transmitter output is very low.	6. Poor connections at connectors E801, J804, P801, or a+ antenna.	6. Check connections.
7. Transmitter operates but cannot be modulated.	7. Improper or loose connections to terminals 19 and 20 of TB805.	7. Check connections.
8. Receiver operates but no audio is heard at speaker or handset.	8. Improper or loose connections at terminals 11 and 12 of TB805.	8. Check connections.

82. Resistance Measurements for Radio Set Control C-847/U

Resistance measurements of Radio Set Control C-847/U are taken across the terminals of terminal boards TB1501 and TB1502: In order to take these measurements the control cable must be disconnected from the terminal boards. The measurements are given for groups of terminals which are in the same circuit, thereby indicating the readings to be expected for each control circuit if it is functioning properly. Be sure to set the controls as shown in the chart to get the specified readings. Refer to figure 53 for location of the terminal boards and terminals.

Terminals Measured	Related control or part	Position of related control	Reading (ohms)
19-20	Handset H-33/PT.	Disconnected.	Infinity
10-14	POWER, indicator lamp I 1501.	In socket.	35
16-17 13-15	VOLUME switch S1501B.	Any position except OFF.	0
4-10	TRANSIT indicator lamp I 1502.	In socket.	35
10-18	Handset H-33/PT.	Disconnected.	Infinity
9-10	SQUELCH switch S1504.	OFF.	0
8-10	SQUELCH potentiometer R1509.	Maximum clockwise. Maximum counterclockwise.	0 500K

82. Resistance Measurements for Radio Set Control C-847/U (contd)

Terminals Measured	Related control or part	Position of related control	Reading (ohms)
5-7	FREQ switch S1503.	1.	0
		2.	Infinity
6-7	FREQ switch S1503.	1.	Infinity
		2.	0
11-12	VOLUME switch S1501A. (SPKR switch in ON position).	First position from OFF.	8.8
		Second position from OFF.	8
		Third position from OFF.	8.1
1-2, 2-3	None.	None.	Infinity

83. Continuity Tests and Resistance Measurements for Electrical Equipment Cabinet CY-938/VRC

This cabinet has no switches or variable parts, therefore, the only troubles that can occur are either short circuits or open circuits. These troubles can be readily discovered and corrected by making continuity checks between the connectors and terminal boards on the rear of the cabinet. Use the lowest resistance range on the ohmmeter for making continuity tests. When trouble shooting the cabinet refer to figure 44 which is a schematic diagram of Electrical Equipment Cabinet CY-938/VRC. The receiver, transmitter, and transmitter power supply should be removed from the cabinet for these tests. Also remove all terminal board jumper connections. The following described tests are grouped according to their function in the radio set. Select the group or groups containing the trouble and perform the continuity and resistance tests as indicated. Check for continuity between the terminals as shown.

Note: Continuity refers to an ohmmeter reading of less than .1 ohm, except where marked with a dagger (†).

a. Filament and Heater Circuits.

Connector	Terminal		Connector	Terminal
J802	10	and	J801	10
J802	15	and	J801	1
J802	28	and	J801	28
J802	28	and	TB804	7
J802	16	and	J801	16

b. Bias and B+ Voltages.

Connector	Terminal		Connector	Terminal
J802	9	and	J801	9
J802	6	and	J801	6

Connector	Terminal		Connector	Terminal
J802	5	and	J801	5
J802	4	and	J801	4
J802	3	and	J801	3
J802	25	and	J801	26
J802	25	and	TB801	4
J802	24	and	J801	27

c. A-C Power Input.

Connector	Terminal		Connector	Terminal
J802	11	and	J803	3
J802	11	and	TB803	5
J802	12	and	J803	4
J802	12	and	TB803	6
J802	13	and	J803	5
J802	13	and	TB805	13

d. Battery Circuits.

Connector	Terminal		Connector	Terminal
J802	21	and	J803	2
J802	20	and	J803	19
J802	22	and	J803	24
J802	22	and	TB803	3
J802	1	and	TB806	1 *
J802	18	and	TB805	17

*** This test checks continuity through fuse F801.**

e. Power Contactor Circuits.

Connector	Terminal		Connector	Terminal
J802	19	and	TB803	1
J802	30	and	TB802	4

f. Push-to-Talk Circuits.

Connector	Terminal		Connector	Terminal
J802	17	and	J801	17
J802	17	and	TB801	5
J802	17	and	TB805	18
J802	14	and	J801	29
J802	14	and	TB804	4

g. Transmitter Crystal Oven Heaters.

Connector	Terminal		Connector	Terminal
J802	7	and	J801	7
J802	8	and	J801	8

h. Transmitter and Receiver Antenna Circuits.

Connector	Terminal		Connector	Terminal
J801	A1	and	J803	A2
J801	A2	and	P801	---

i. Transmitter Modulator Circuit.

Connector	Terminal		Connector	Terminal
J801	13	and	TB805	19
J801	14	and	TB801	10
J801	15	and	TB805	20

j. Transmitter Frequency-Changing Circuit.

Connector	Terminal		Connector	Terminal
J801	11	and	TB804	5
J801	12	and	TB804	6

k. Receiver Relay Circuit.

Connector	Terminal		Connector	Terminal
J803	27	and	TB801	6
J803	28	and	TB801	7
J803	29	and	TB801	8
J803	11	and	TB802	6
J803	12	and	TB802	10
J803	13	and	TB802	2

l. Receiver Squelch Circuit.

Connector	Terminal		Connector	Terminal
J803	8	and	TB804	8
J803	9	and	TB804	9
J803	17	and	TB801	3

m. Receiver Audio Output Circuit.

Connector	Terminal		Connector	Terminal
J803	14	and	TB805	11
J803	14	and	TB801	2
J803	15	and	TB802	9

n. Receiver Audio Output Circuit Resistance Measurements.

Connector	Terminal		Connector	Terminal	Resistance
TB801	1	and	TB801	2	680 ohms
TB801	1	and	TB802	9	2200 ohms
TB801	2	and	TB802	9	2880 ohms

o. Receiver Pilot and Call Lamp Circuits.

Connector	Terminal		Connector	Terminal
J803	10	and	TB802	1
J803	6	and	TB805	14
J803	6	and	TB802	5

p. Terminal Board Interconnections.

Connector	Terminal		Connector	Terminal
TB802	3	and	TB803	2
TB802	3	and	TB805	16
TB802	8	and	TB805	12
TB803	4	and	TB805	15

q. Ground Connections.

		Connector	Terminal
Chassis ground	and	J801	2
Chassis ground	and	J802	2
Chassis ground	and	J803	1
Chassis ground	and	TB801	9
Chassis ground	and	TB802	7
Chassis ground	and	TB804	10
Chassis ground	and	TB806	2

Section III. REPAIRS

84. General

For information concerning the replacement of parts in the transmitter, receiver, or either power supply, consult the specific component instruction book. The descriptions to follow are for replacement of parts in Radio Set Control C-847/U and Electrical Equipment Cabinet CY-938/VRC.

85. Replacement of Parts in Radio Set Control C-847/U (fig. 53)

The indicator lamps can be changed by unscrewing the jewel assembly of the POWER and TRANSMIT sockets from the front panel. Push in the bulb and turn counterclockwise to release it from the socket. Replace by reversing the procedure. Be-

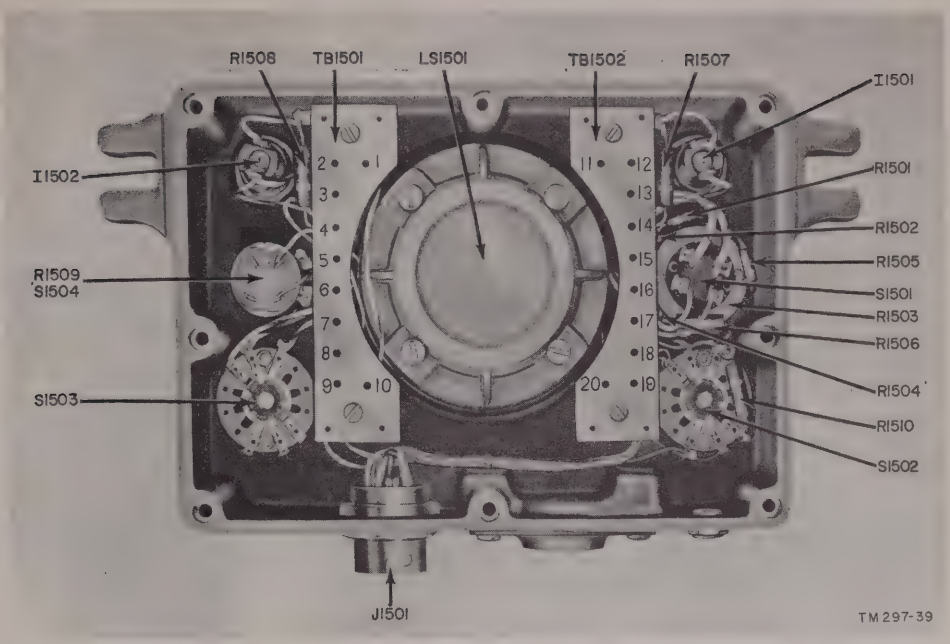


Figure 53. Rear view of Radio Set Control C-847/U with cover removed.

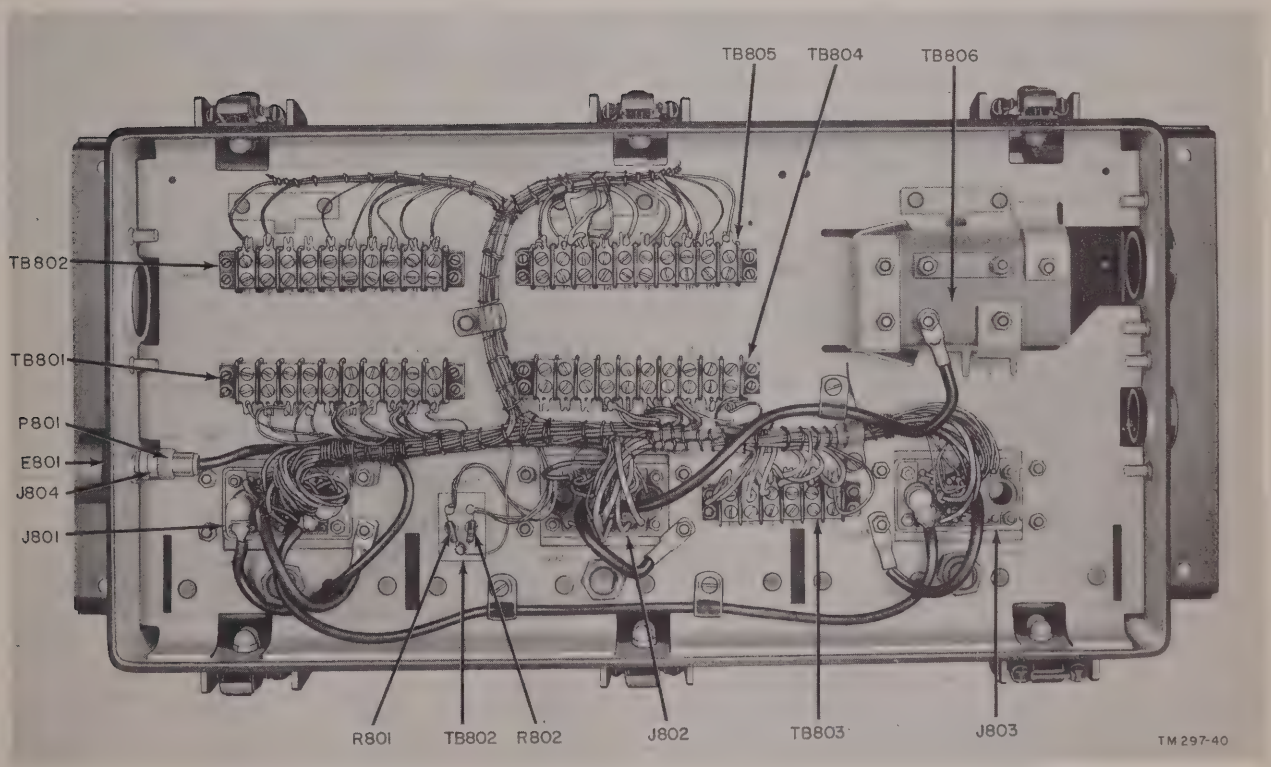


Figure 54. Rear view of Electrical Equipment Cabinet CY-938/VRC with cover removed.

fore any of the front panel controls can be removed, the knobs must first be taken from the control shaft. The knobs are held to the shaft by standard screws. Once the knobs are off use the following procedure in removing the controls.

a. Loosen the 8 captive screws on the rear cover and take off the cover.

b. Disconnect all wires from the control except those which go from lug to lug on the control. Mark each wire so that it can be reconnected properly when the control is replaced.

c. Remove the front panel nut securing the control.

d. Wire the new control with the jumpers and resistors exactly as the old one was wired.

e. Mount the new control by reversing step c and connect all the necessary wiring.

f. Sometimes it may be necessary to reverse the sequence of steps b and c to facilitate disconnection of the wiring.

g. The pilot lamp sockets are removed in a similar manner.

h. The terminal boards are secured by two screws each.

86. Replacement of Parts in Electrical Equipment Cabinet CY-938/VRC (fig. 54).

The trunk type latches on the cabinet are each held by two screws. Removal of the screws allows replacement of the latches. The antenna coaxial connector P801 is disconnected from jack J804 by turning it one-quarter turn counterclockwise. The connector (E801) mounted on one side of the cabinet is fastened by one palnut. To remove the terminal boards or jacks (J801, J802, and J803), use the following procedure:

a. Unsolder all wiring to the terminal board or jack. Mark each wire so that it may be replaced correctly.

b. Take out the four screws and remove the board or jack.

c. Reverse the procedure to replace the boards and jacks.

d. Make sure all connections are tight, especially the ground connections to the cabinet.

CHAPTER 6

SHIPMENT AND LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT AND LIMITED STORAGE

87. Disassembly

The following instructions are recommended as a guide for preparing the radio set for transportation and storage.

a. Disconnect Handset H-33/PT from Radio Set Control C-847/U.

b. Disconnect the coaxial cable from the antenna and Electrical Equipment Cabinet CY-938/VRC. Coil this cable for packing.

c. Remove the antenna and antenna mount from the vehicle and pack them in the way they were received.

d. Disconnect the battery cable from the battery and unfasten it from the vehicle so that it is just attached at Electrical Equipment Cabinet CY-938/VRC.

e. Remove Radio Set Control C-847/U from the mounting bracket or mounting surface. Remove the back cover and disconnect the control cable by pulling the cable leads from their jacks. Replace the rear cover of the control.

f. Remove the control bracket (if used) from the vehicle.

g. Remove the front cover of Electrical Equipment Cabinet CY-938/VRC. Take Radio Receiver R-394/U from the cabinet. Disconnect the battery cables and replace the receiver and front cover.

h. Remove the four mounting bolts securing Electrical Equipment Cabinet CY-938/VRC to Electrical Equipment Rack MT-1236/VRC and remove the cabinet from the vehicle.

i. Remove the rear cover of Electrical Equipment Cabinet CY-938/VRC and disconnect the leads of the control cable. Then pull the control cable away from the cabinet. Replace the rear cover.

j. Unbolt Electrical Equipment Rack MT-1236/VRC from the vehicle.

88. Repacking for Shipment or Limited Storage

a. The exact procedure in repacking for shipment or limited storage depends on how much original packing material was saved or what new material is available. It also depends on the conditions under which the radio set is to be shipped or stored. Repack the equipment by reversing the instructions given in paragraph 25 if possible. When the original packing cases and cartons are not available, try to duplicate the original packing, however, the radio set can be packed in several smaller packing cases.

b. Whenever practicable, place a dehydrating agent such as silica gel inside the chest. Do not use old dehydrating agents since they will offer no protection against moisture damaging the equipment. Protect the packaging with a water-proof sealing compound or tape. Always provide at least 3 inches of excelsior padding or similar material between the inner cartons and the packing case.

Section II. DEMOLITION OF MATERIAL TO PREVENT ENEMY USE

89. General

The demolition procedures outlined in paragraph 88 will be used to prevent the enemy from using or salvaging this equipment. Demolition of the equipment will be accomplished only upon order of the commander.

90. Methods of Destruction

a. Smash. Smash the crystals, controls, tubes, coils, switches, capacitors, transformers, and headsets, using sledges, axes, handaxes, hammers, crowbars, or other heavy tools.

b. Cut. Cut cords, headsets, and wiring, using axes, handaxes, or machetes.

c. Burn. Burn cords, resistors, capacitors, coils, wiring, and technical manuals, using gasoline, kerosene, oil, flame throwers, or incendiary grenades.

d. Bend. Bend panels, cabinet, and chassis.

e. Explosives. If explosives are necessary, use firearms, grenades, or TNT.

f. Disposal Bury or scatter the destroyed parts in slit trenches, fox holes, or other holes, or throw them into streams.

g. Destroy. Destroy everything.

APPENDIX I
REFERENCES

Note: For availability of items listed, check SR-310-20-3 and SR-310-20-4. Check Department of the Army Supply Catalog SIG 1 for Signal Corps Supply Catalog pamphlets.

1. Army Regulations

AR 380-5	Military Security (Safeguarding Military Information).
AR 750-5	Maintenance of Supplies and Equipment (Maintenance Responsibilities and Shop Operation).

2. Supply Bulletins

SB 11-6	Dry Battery Supply Data.
SB 11-47	Preparation and Submission of Requisitions for Signal Corps Supplies.
SB 11-76	Signal Corps Kit and Materials for Moisture-and Fungi-Resistant Treatment.

3. Auxiliary Equipment and Test Equipment

NAVSHIPS 91,274	Tube Tester TV-3/U.
NAVSHIPS 91,269	Electronic Multimeter ME-6 A/U.
NAVSHIPS 91,272	Oscilloscope OS-8A/U.
TM 11-300	Frequency Meter Sets SCR-211A, B, C, D, E, F, J, K, L, M, N, O, P, Q, R, T, AA, AC, AE, AF, AG, AH, AJ, AK, AL.
TM 11-303	Test Sets I-56-C, I-56-D, I-56-H, and I-56-J.
TM 11-321	Technical Manual for Test Set I-56-E.
TM 11-472	Repair and Calibration of Electrical Measuring Instruments.
TM 11-1257	Signal Generator AN/URM-48.
TM 11-1258 (when available)	Signal Generator SG-3 (when available)
TM 11-2524	Oscillators I-151-A and I-151-E.
TM 11-2526	Oscilloscope BC-1060-A.
TM 11-2613	Votohmmeter I-166.
TM 11-2624B	Voltohmmeters TS-294/U, TS-294B/U, and TS-294C/U.
TM 11-2626	Test Unit I-176, I-176-A, and I-176-B.
TM 11-2627	Tube Tester I-177 and I-177-A.
TM 11-2684A	Audio Oscillator TS-382A/U.
TM 11-4700	Electrical Indicating and Measuring Instruments, Repair Instructions.
TM 11-5511	Electronic Multimeter TS-505/U.
TM 11-5043	Analyzer ZM-3/U.
TM 11-5527	Multimeter TS-352/U.
Commercial Instruction Book	Signal Generator, Boonton Radio Corporation, Model 202 B.

4. Painting, Preserving, and Lubrication

TB SIG 13	Moistureproofing and Fungiproofing Signal Corps Equipment.
TB SIG 69	Lubrication of Ground Signal Equipment.

TM 9-2851	Painting Instructions for Field Use.

5. Camouflage, Decontamination, and Demolition

FM 5-20	Camouflage, Basic Principles.
FM 5-25	Explosives and Demolitions.
TM 3-220	Decontamination.
TM 5-267	Camouflage.

6. Other Publications

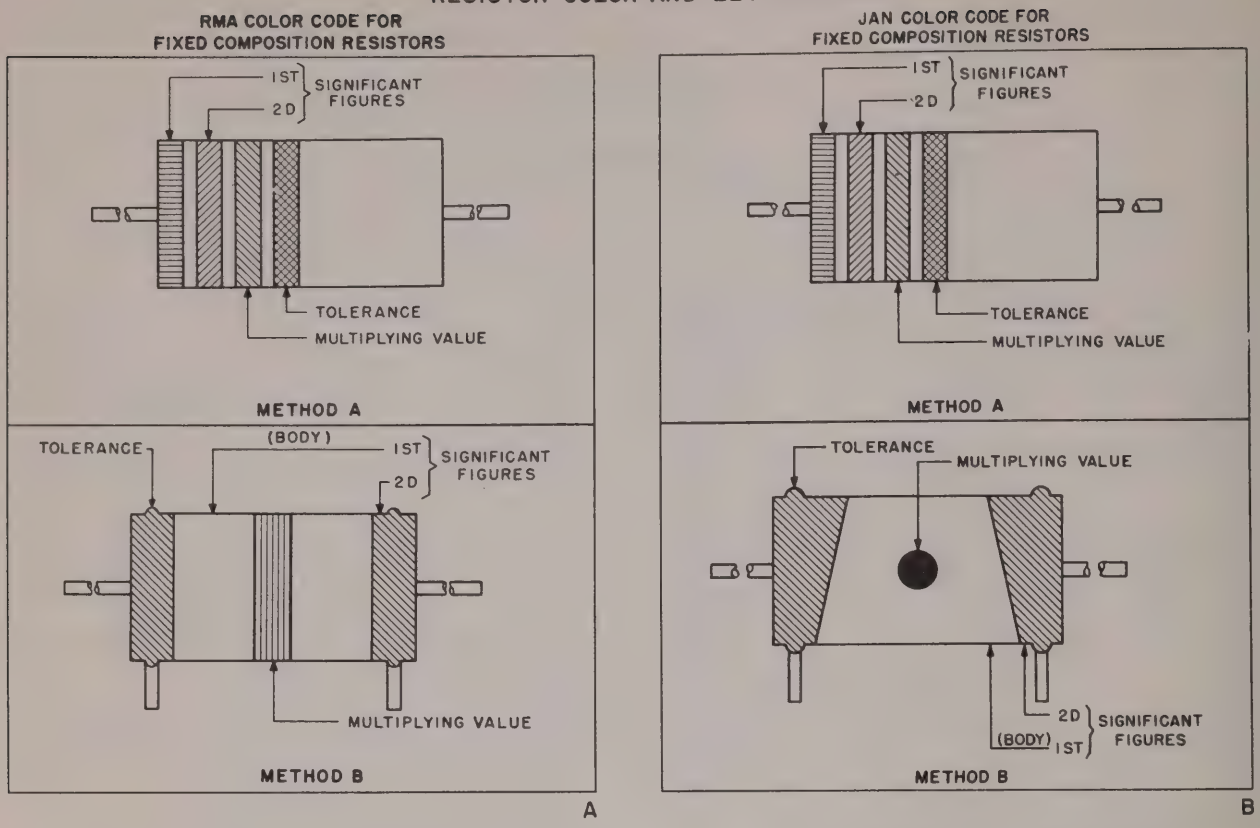
FM 24-18	Field Radio Techniques.
FM 72-20	Jungle Warfare.
SR 310-20-3	Index of Training Publications.
SR 310-20-4	Index of Technical Manuals, Technical Regulations, Technical Bulletins, Supply Bulletins, Lubrication Orders, Modification Work Orders, Tables of Organization and Equipment, Reduction Tables, Tables of Allowances, Table of Organization, and Tables of Equipment.
SR 310-20-5	Index of Administrative Publications.
SR 700-45-5	Unsatisfactory Equipment Report (Reports Control Symbol CSGLD-247).
SR 745-5)) NAV DEPT) SERIAL) 85P00)) AFR 71-4)	Report of Damaged or Improper Shipment (Reports Control Symbols CSGLD-66 (Army), SandA-70-6 (Navy), and AF-MC-U2 (Air Force)).
TB SIG 4	Methods for Improving the Effectiveness of Jungle Radio Communication.
TB SIG 25	Preventive Maintenance of Power Cords.
TB SIG 54	Working through Jamming with Frequency Modulated Radio Sets.
TB SIG 66	Winter Maintenance of Signal Equipment.
TB SIG 72	Tropical Maintenance of Ground Signal Equipment.
TB SIG 75	Desert Maintenance of Ground Signal Equipment.
TB SIG 123	Preventive Maintenance Practices for Ground Signal Equipment.
TB SIG 178	Preventive Maintenance Guide for Radio Communication Equipment.
TB SIG 219	Operation of Signal Equipment at Low Temperatures.
TB SIG 223	Field Expedients for Wire and Radio.
TM 9-2857	Storage Batteries Lead-Acid Type.
TM 11-314	Antennas and Antenna Systems.
TM 11-415	Dry Batteries.
TM 11-430	Batteries for Signal Communication. Except those pertaining to Aircraft.
TM 11-453	Shop Work.
TM 11-455	Radio Fundamentals.
TM 11-466	Radar Electronic Fundamentals.
TM 11-483	Suppression of Radio Noises.
TM 11-661	Electrical Fundamentals (Direct Current).
TM 11-662	Theory and Application of Electron Tubes.
TM 11-681	Electrical Fundamentals (Alternating Current).
TM 11-4000	Trouble Shooting and Repair of Radio Equipment.

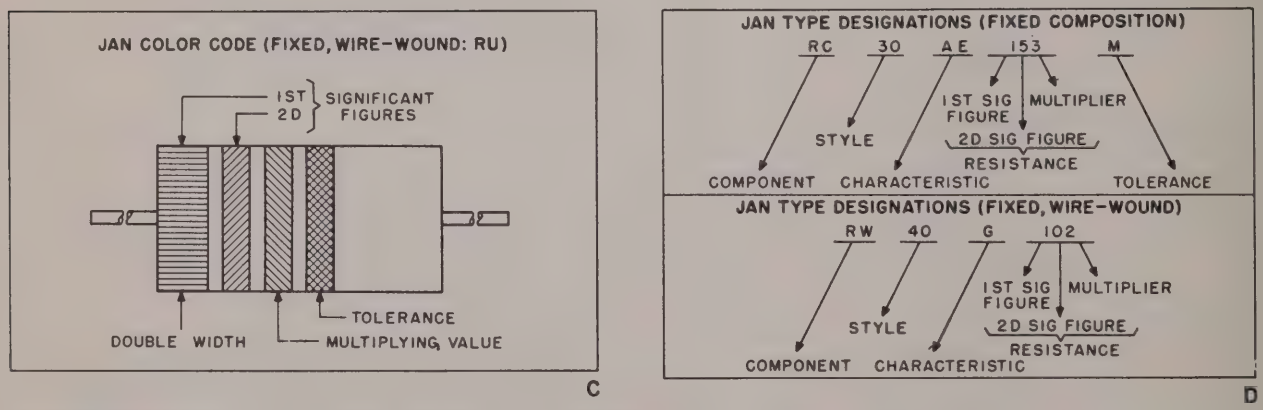
GLOSSARY

ABBREVIATIONS

A-c . . . . . alternating current
Adj, ADJ . . . . . adjustment, adjust
a m . . . . . amplitude-modulated
amp, A . . . . . ampere
AMPL . . . . . amplifier
ANT . . . . . antenna
avc, AVC . . . . . automatic volume control
cps . . . . . cycles per second
c-w . . . . . continuous-wave
d-c . . . . . direct-current
DOUB . . . . . doubler
freq . . . . . frequency
gnd . . . . . ground
h-f . . . . . high-frequency
h-v . . . . . high-voltage
i-f . . . . . intermediate-frequency
INT . . . . . intermediate
kc . . . . . kilocycle
ma . . . . . milliampere
max . . . . . maximum
mc . . . . . megacycle
meg, MEG . . . . . megohm
MIC . . . . . microphone
mo . . . . . master oscillator
OSC . . . . . oscillator
pa . . . . . power amplifier
REC . . . . . receiver
r-f . . . . . radio-frequency
term . . . . . terminal
uf, UF . . . . . microfarad
uuf, UUF . . . . . micromicrofarad
v, V . . . . . volt
vhf . . . . . very high frequency
VOL . . . . . volume
w, W . . . . . watt
xmtr . . . . . transmitter
XTAL . . . . . crystal

RESISTOR COLOR AND LETTER CODE





STANDARDS				
COLOR	SIGNIFICANT FIGURE	MULTIPLYING VALUE	TOLERANCE (%)	JAN LETTER TOLERANCE
BLACK	0	1	–	–
BROWN	1	10	± 1	F
RED	2	100	± 2	G
ORANGE	3	1,000	± 3	–
YELLOW	4	10,000	± 4	–
GREEN	5	100,000	± 5	–
BLUE	6	1,000,000	± 6	–
VIOLET	7	10,000,000	± 7	–
GRAY	8	100,000,000	± 8	–
WHITE	9	1,000,000,000	± 9	–
GOLD	–	0.1	± 5	J
SILVER	–	0.01	±10	K
NO COLOR	–	–	±20	M

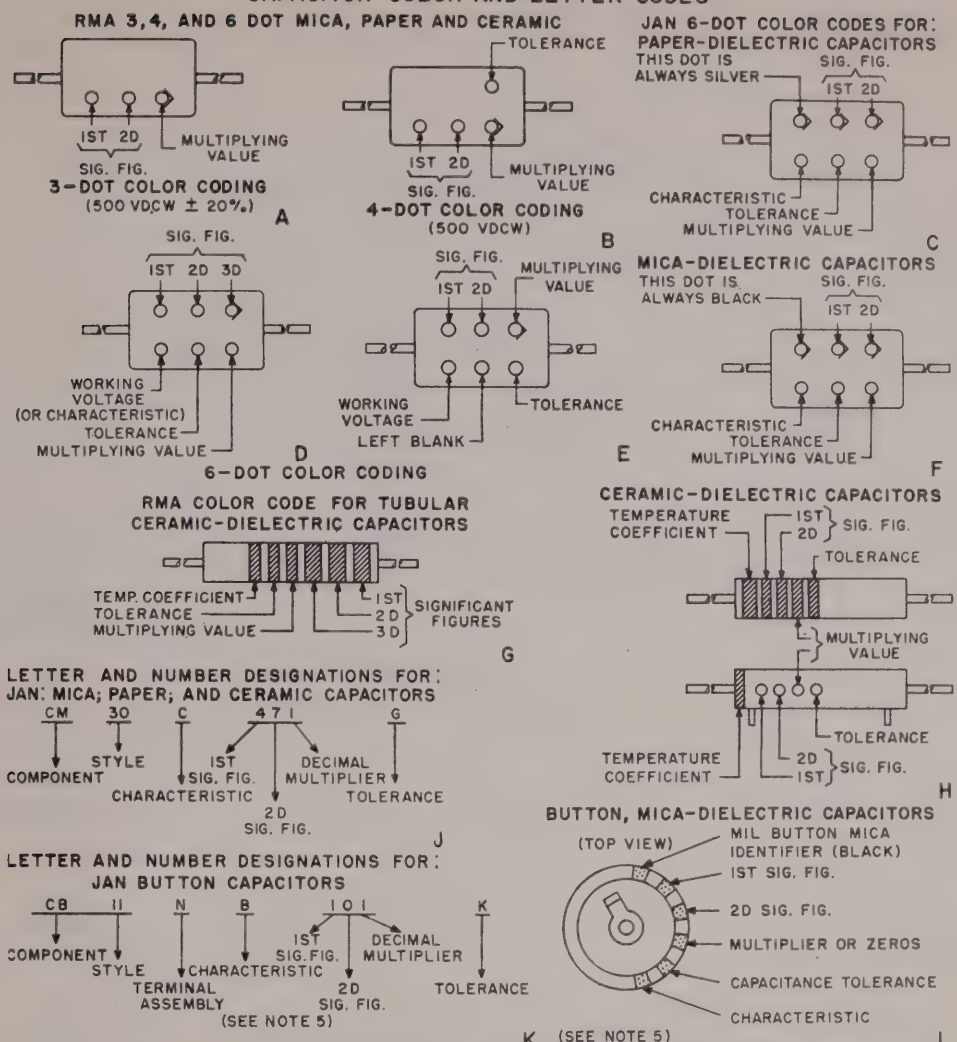
NOTES:

1. RESISTORS WITH AXIAL LEADS ARE INSULATED. RESISTORS WITH RADIAL LEADS ARE NON-INSULATED.
2. RMA: RADIO MANUFACTURERS ASSOCIATION.
3. JAN: JOINT ARMY-NAVY.
4. THESE COLOR AND NUMBER CODES GIVE ALL RESISTANCE VALUES IN OHMS.
5. RESISTIVE COMPONENTS USED FOR LETTER TOLERANCES ARE: RC, RN, AND RU.
6. WATTAGE FOR RW TYPES IS FOUND IN THE JAN SPECIFICATIONS UNDER CHARACTERISTICS.

TM RC

Figure 55. Resistor color codes.

CAPACITOR COLOR AND LETTER CODES



- STANDARDS -					JAN MICA-CM		JAN PAPER-CM		JAN CERAMIC-CC					
										CAP. TOL. FOR MORE THAN 10 UUF		CAP. TOL. FOR 10 UUF OR LESS		
COLOR	SIG. FIG.	DECIMAL MULTIPLIER	% TOL.	VDCW	LETTER TOL.	CHARAC-TERISTIC	LETTER TOL.	CHARAC-TERISTIC	DEC. MULT.	%	LETTER DESIG-NATION	UUF	LETTER DESIG-NATION	CHARAC-TERISTIC
BLACK	0	1	±20	500	M	A	M	A	1	±20	M	±2.0	G	C
BROWN	1	10	± 1	100	-	B	-	E	10	± 1	F	-	-	H
RED	2	100	± 2	200	G	C	-	H	100	± 2	G	-	-	L
ORANGE	3	1,000	± 3	300	-	D	N*	J	1,000	-	-	-	-	P
YELLOW	4	10,000	± 4	400	-	E	-	P	-	-	-	-	-	R
GREEN	5	100,000	± 5	500	-	F	-	R	-	± 5	J	±0.5	D	S
BLUE	6	1,000,000	± 6	600	-	G	-	S	-	-	-	-	-	T
VIOLET	7	10,000,000	± 7	700	-	-	-	T	-	-	-	-	-	U
GRAY	8	100,000,000	± 8	800	-	-	-	-	0.01	-	-	±0.25	C	B
WHITE	9	1,000,000,000	± 9	900	-	-	-	-	0.1	± 10	K	±1.0	F	SL
GOLD	-	0.1	± 5	1,000	J	-	-	-	-	-	-	-	-	A
SILVER	-	0.01	±10	2,000	K	-	K	-	-	-	-	-	-	-
NO COLOR	-	-	±20	500	-	-	-	-	-	-	-	-	-	-

*. THE TOLERANCE OF THIS CAPACITOR IS ±30%, NOT ±3%

NOTES

JAN: JOINT ARMY-NAVY
RMA: RADIO MANUFACTURERS ASSOCIATION

1. THESE COLOR AND LETTER CODES GIVE CAPACITANCES IN MICROMICROFARADS
2. THIS TABLE IS ADAPTED FOR JAN AND RMA COLOR AND JAN LETTER TYPE DESIGNATIONS
3. CERAMIC AND MICA CAPACITORS, BOTH JAN AND RMA, ARE GENERALLY 500 VDCW
4. BUTTON CAPACITORS ARE GENERALLY 300 VDCW
5. READ BUTTON CAPACITOR TOLERANCE UNDER CERAMICS OF MORE THAN 10 UUF
6. CHARACTERISTICS ARE AVAILABLE IN JAN CAPACITOR SPECIFICATION MANUALS
7. THE COMPONENTS USED ABOVE FOR JAN LETTER TYPE DESIGNATIONS ARE:
   CB MICA BUTTON: *CC* CERAMIC; *CM* MICA MOULDED: *CN* PAPER MOULDED

TM CC

Figure 56. Capacitor color codes.

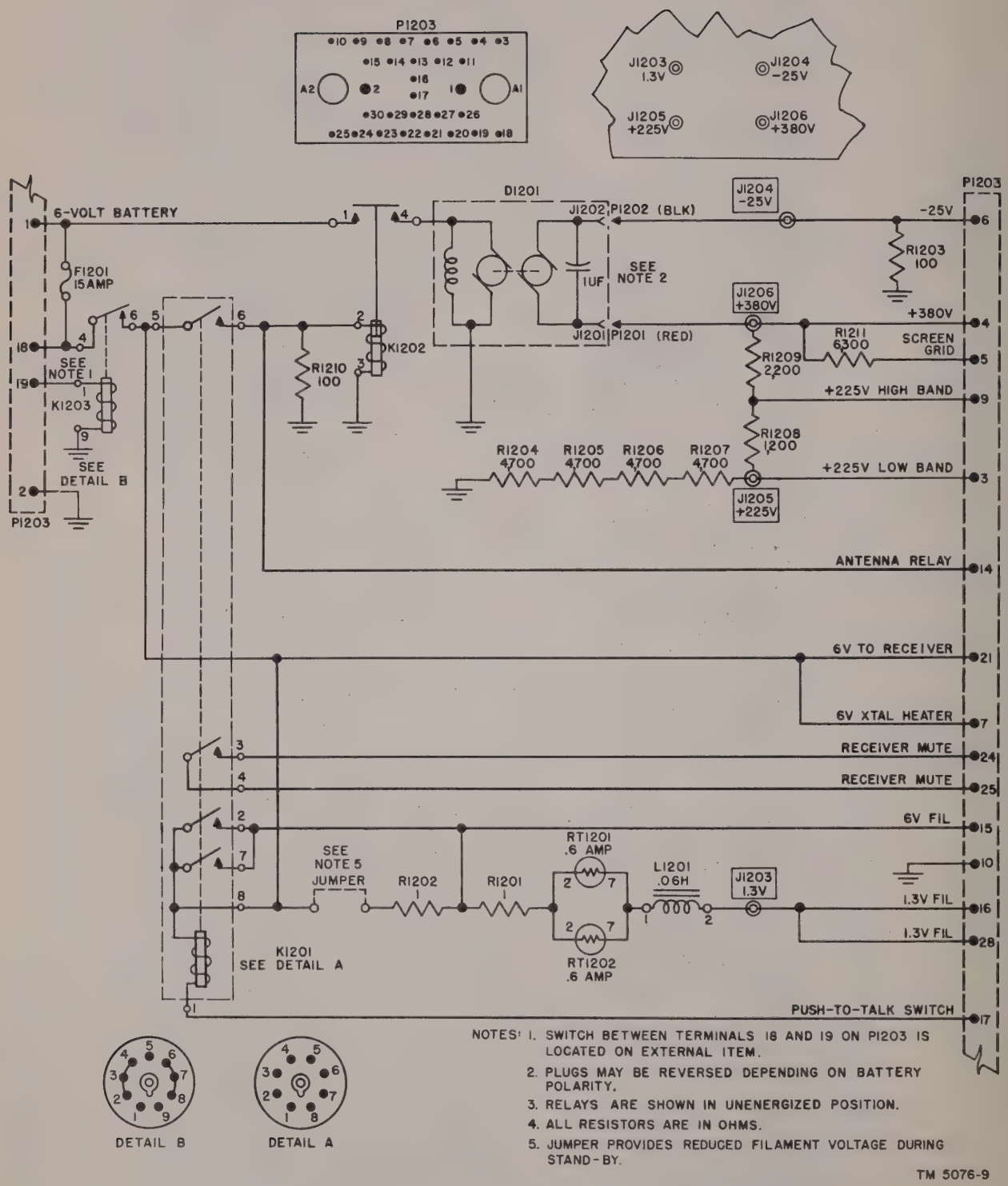


Figure 57. Dynamotor-Power Supply DY-100/U, schematic diagram (6-volt).

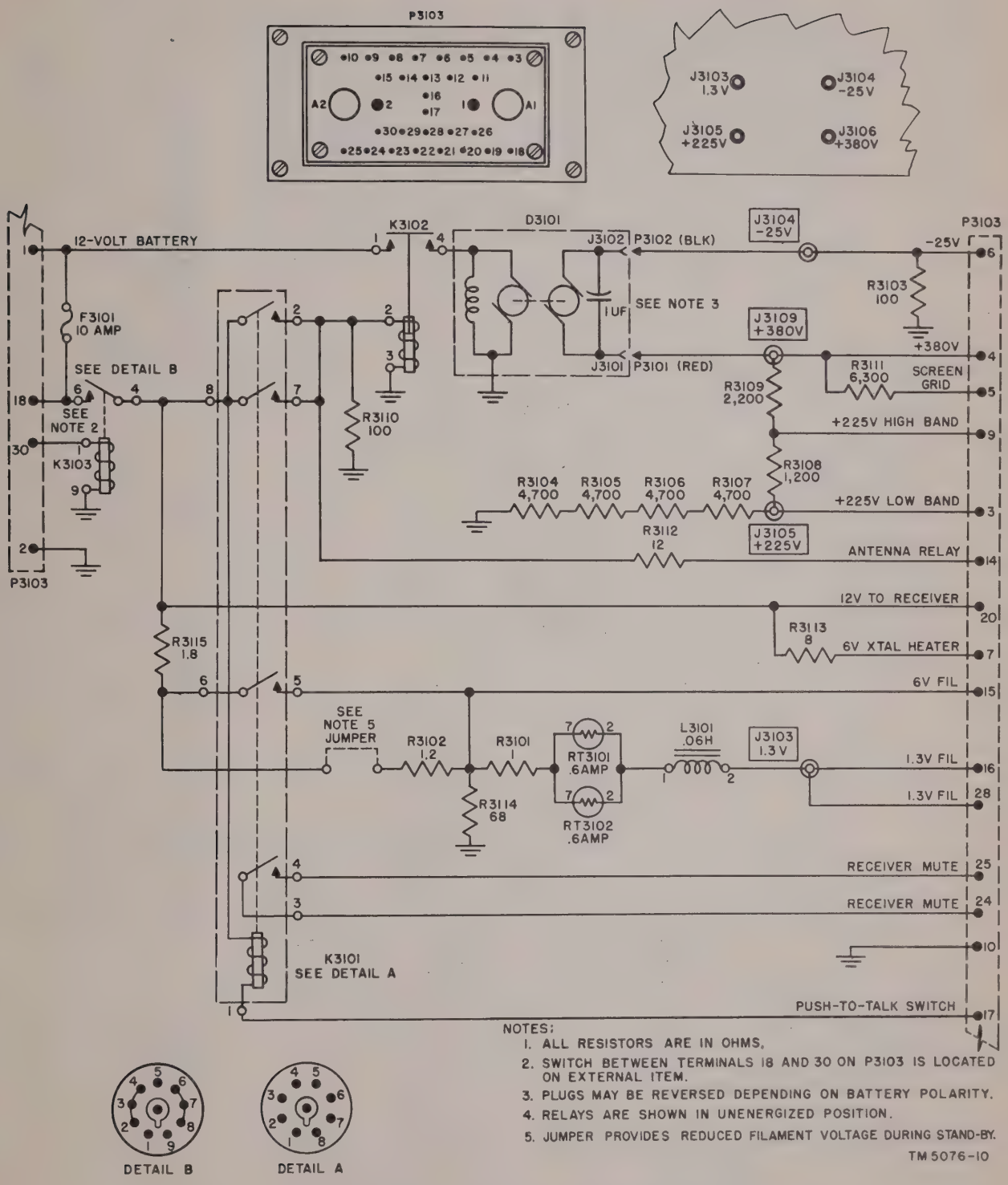
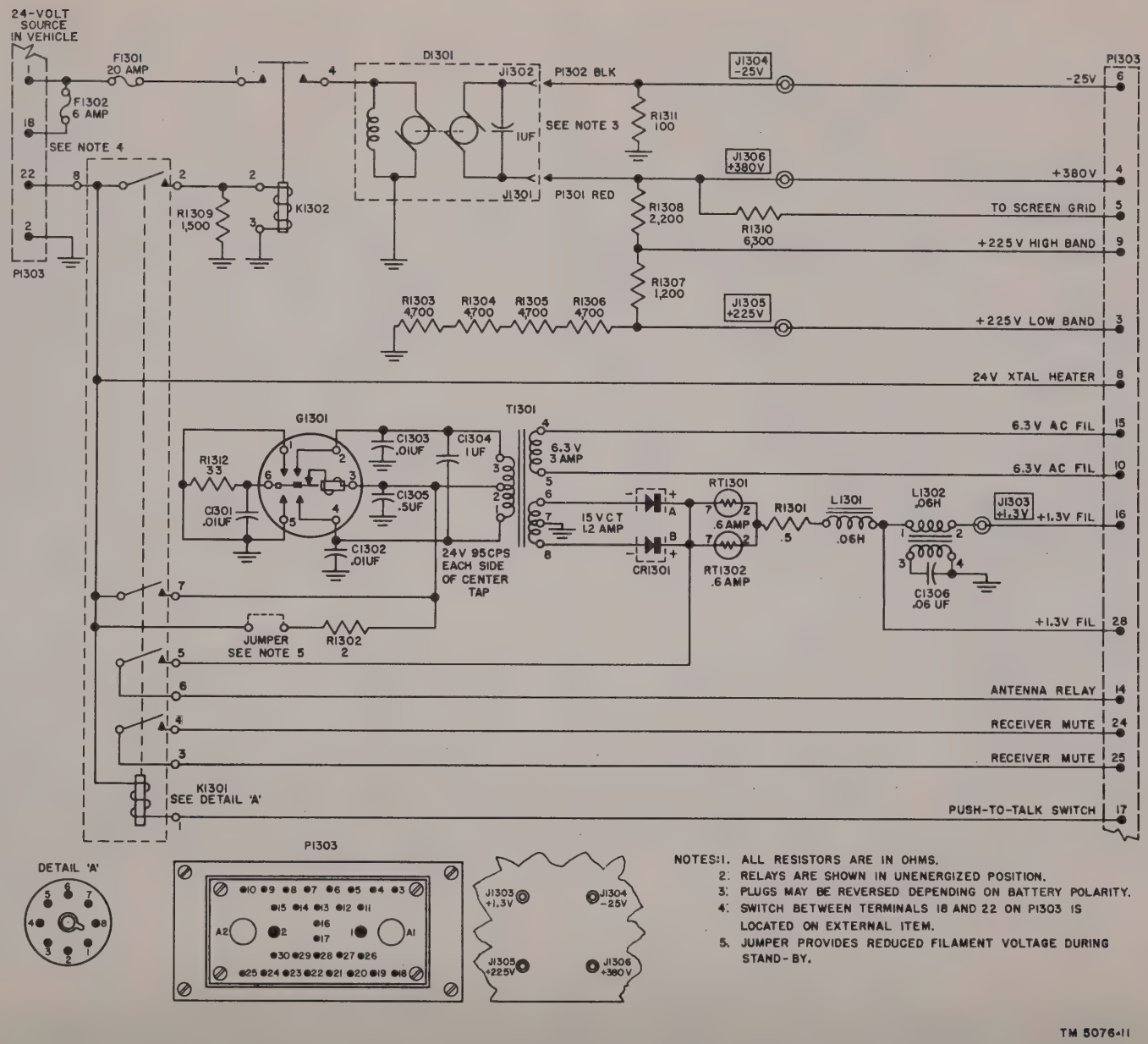


Figure 58. Dynamotor DY-93/U, schematic diagram (12-volt).



NOTES: 1. ALL RESISTORS ARE IN OHMS.
2. RELAYS ARE SHOWN IN UNENERGIZED POSITION.
3. PLUGS MAY BE REVERSED DEPENDING ON BATTERY POLARITY.
4. SWITCH BETWEEN TERMINALS 18 AND 22 ON P1303 IS LOCATED ON EXTERNAL ITEM.
5. JUMPER PROVIDES REDUCED FILAMENT VOLTAGE DURING STAND-BY.

TM 5076-11

Figure 59. Dynamotor - Power Supply DY-98/G, schematic diagram (24-volt).

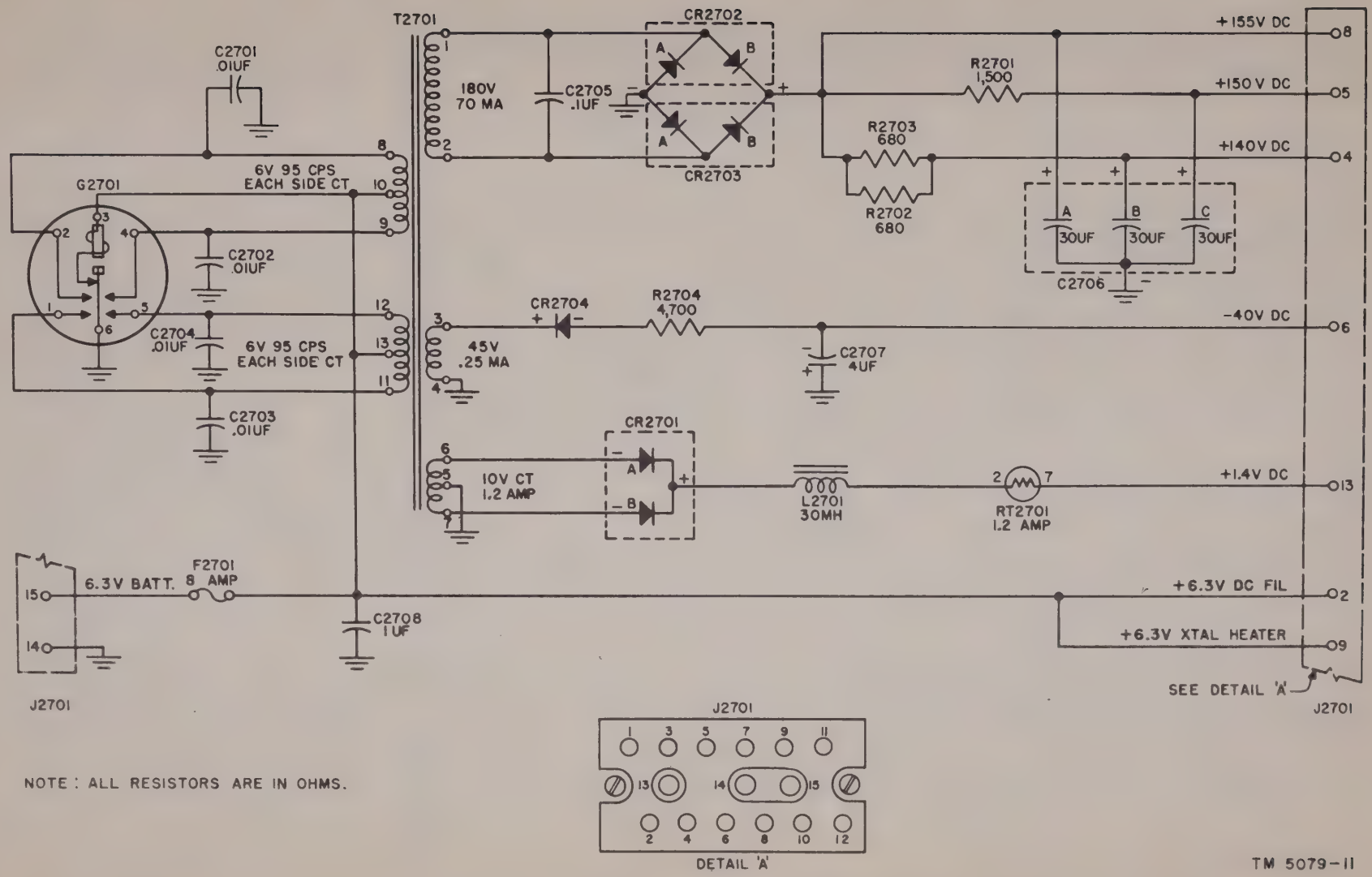


Figure 60. Power Supply PP-869/U, schematic diagram (6-volt).

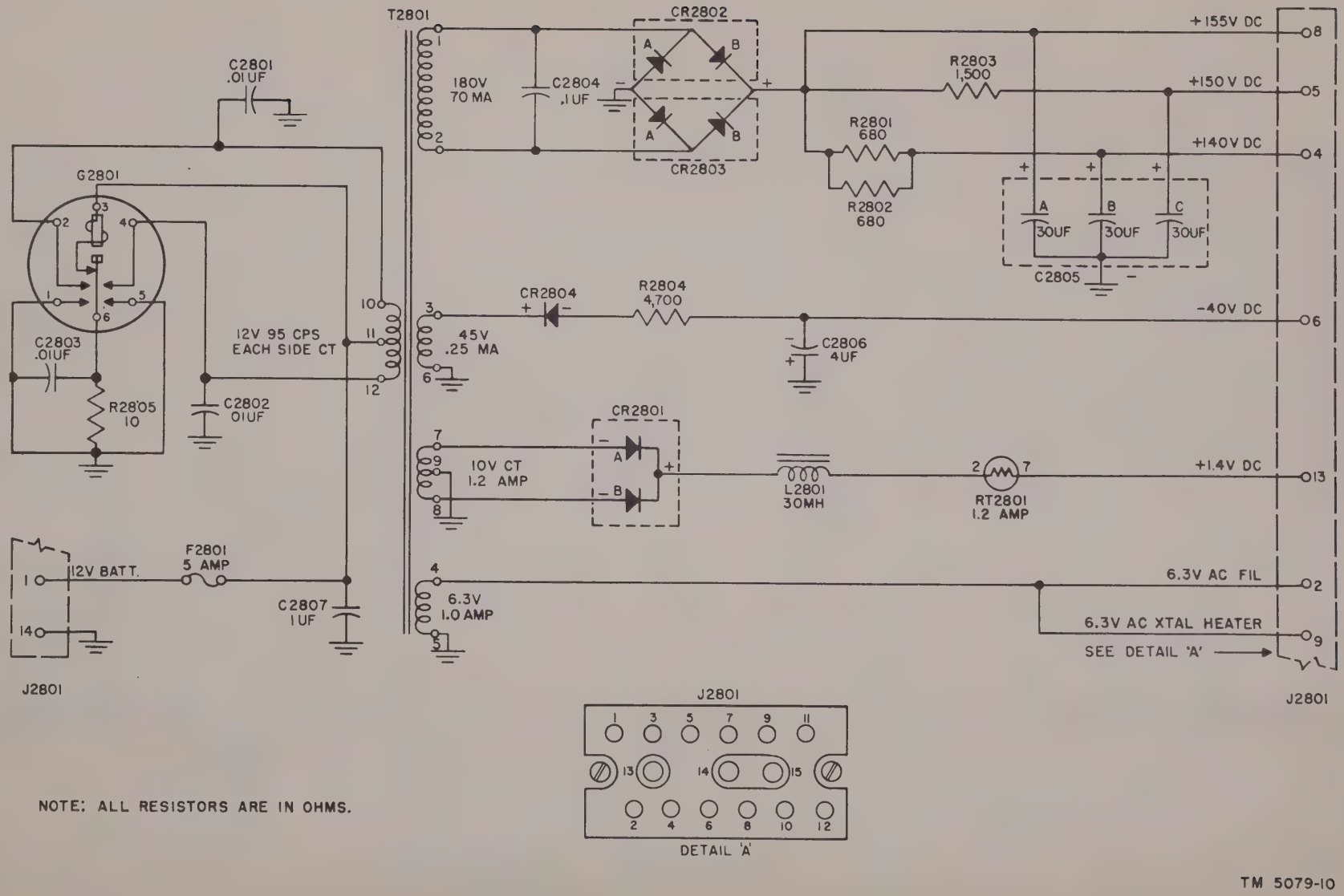


Figure 61. Power Supply PP-868/U, schematic diagram (12-volt).

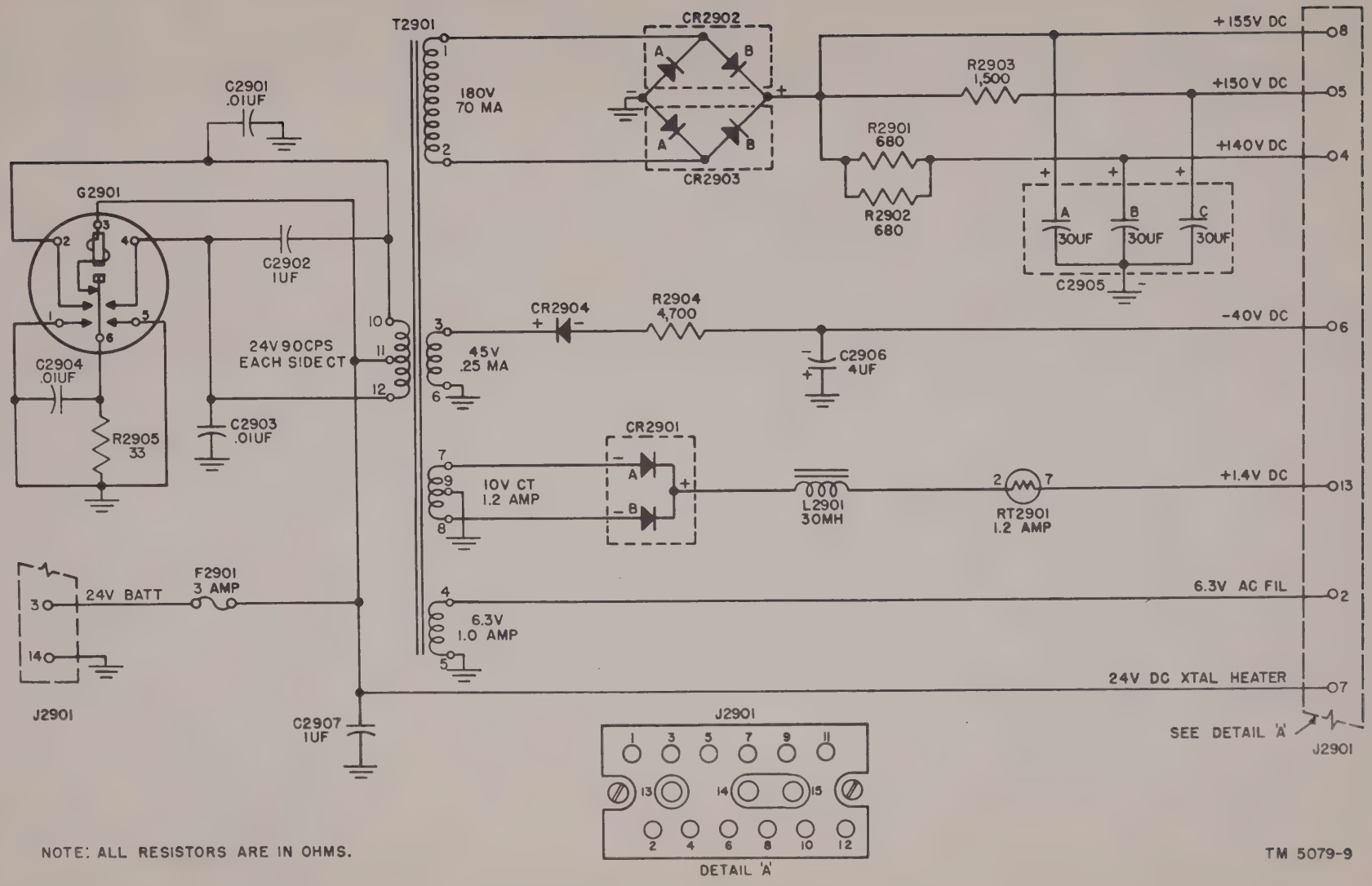
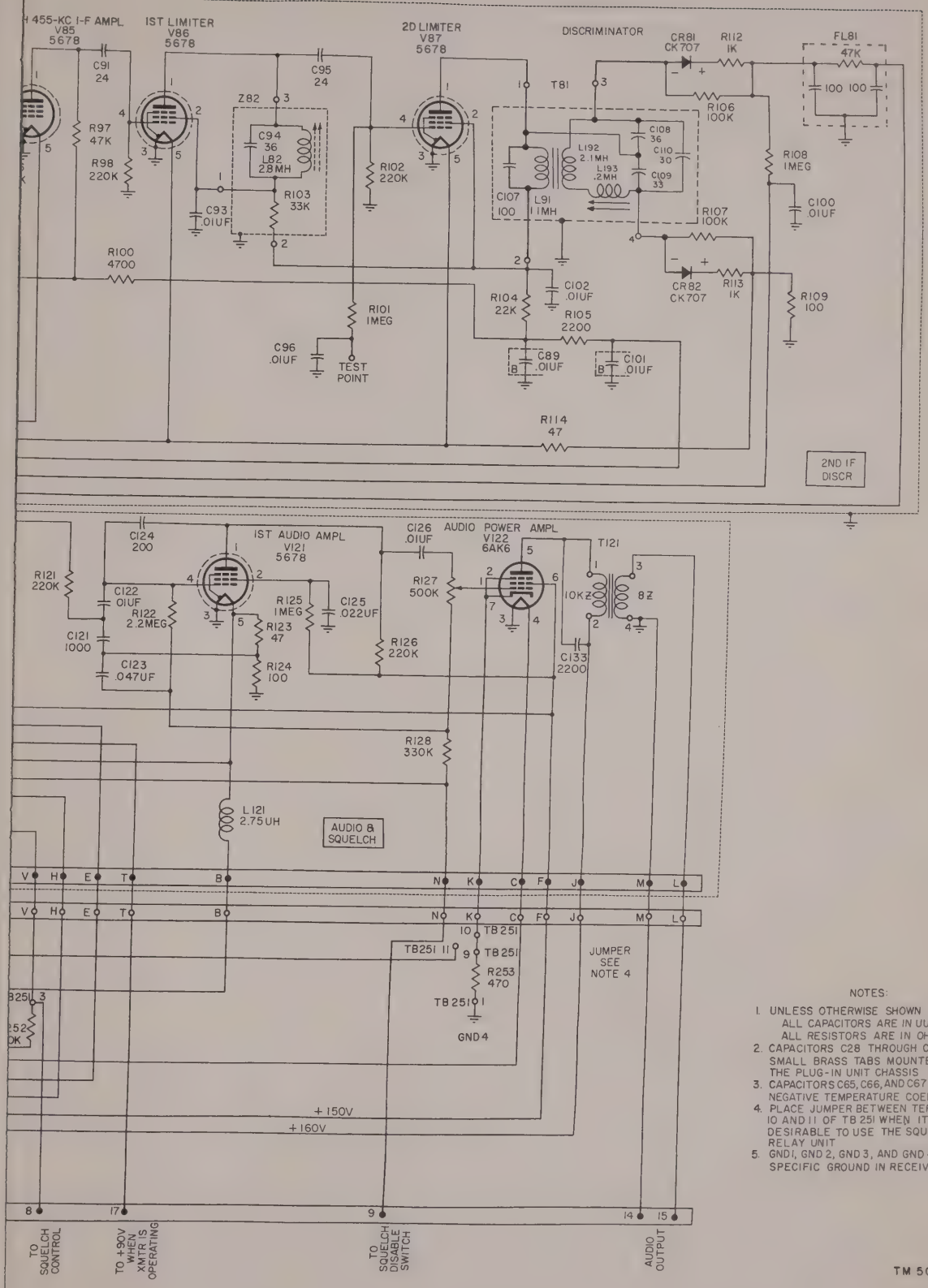


Figure 62. Power Supply PP-867/U, schematic diagram (24-volt).



NOTES:

1. UNLESS OTHERWISE SHOWN ALL CAPACITORS ARE IN UUF; ALL RESISTORS ARE IN OHMS
2. CAPACITORS C28 THROUGH C31 ARE SMALL BRASS TABS MOUNTED BELOW THE PLUG-IN UNIT CHASSIS
3. CAPACITORS C65, C66, AND C67 HAVE A NEGATIVE TEMPERATURE COEFFICIENT
4. PLACE JUMPER BETWEEN TERMINALS 10 AND 11 OF TB 251 WHEN IT IS DESIRABLE TO USE THE SQUELCH RELAY UNIT
5. GND1, GND 2, GND 3, AND GND 4 SPECIFIC GROUND IN RECEIVER BASE.

TM 5092-500

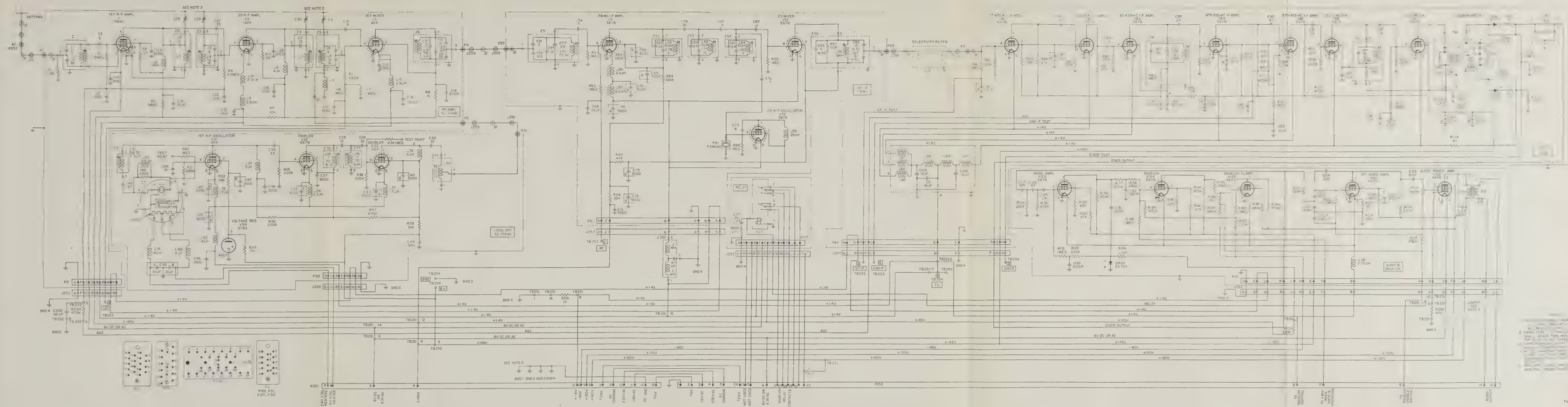
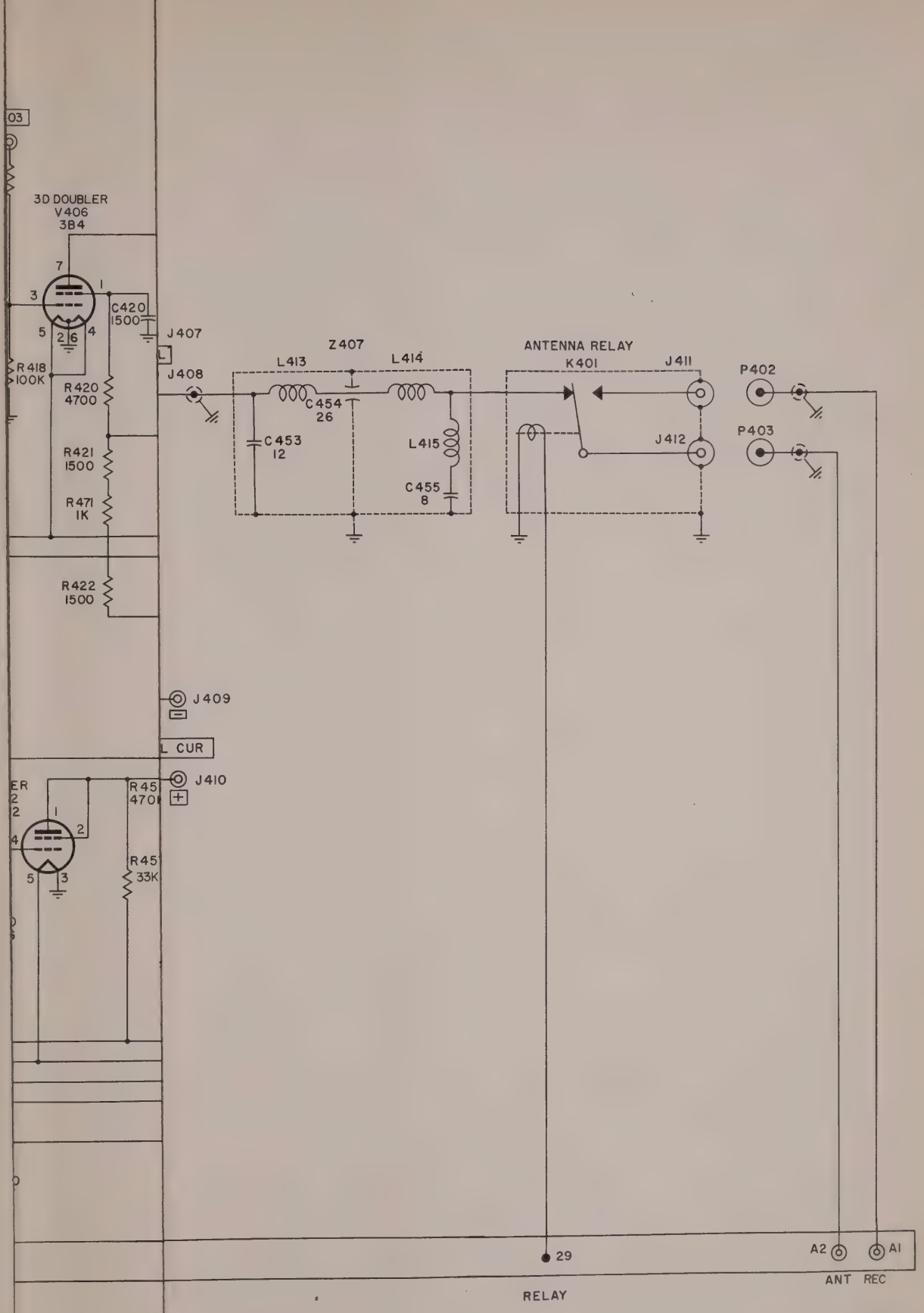


Figure 63. Radio Receiver R-394/U, schematic diagram.


03
3D DOUBLER
V406
3B4
7
3
1
5
2
6
4
C420
1500
J407
L
J408
R418
100K
R420
4700
R421
1500
R471
1K
R422
1500
Z407
L413
L414
C454
26
C453
12
L415
C455
8
ANTENNA RELAY
K401
J411
J412
P402
P403
J409
L CUR
J410
ER
2
2
4
1
2
5
3
R45
470
R45
33K
29
A2
A1
ANT
REC
RELAY

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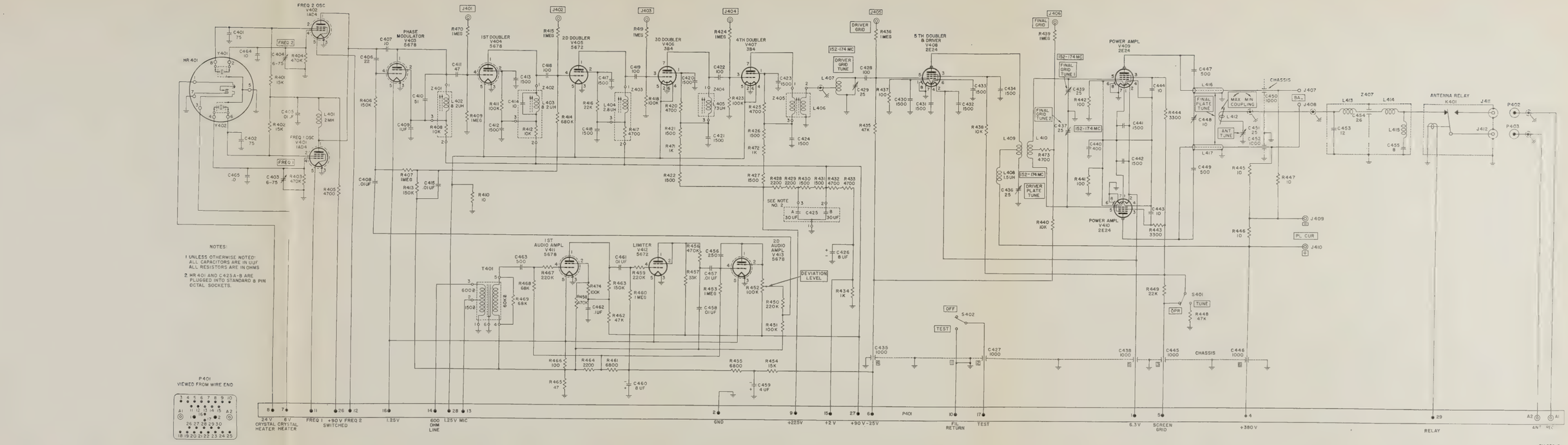
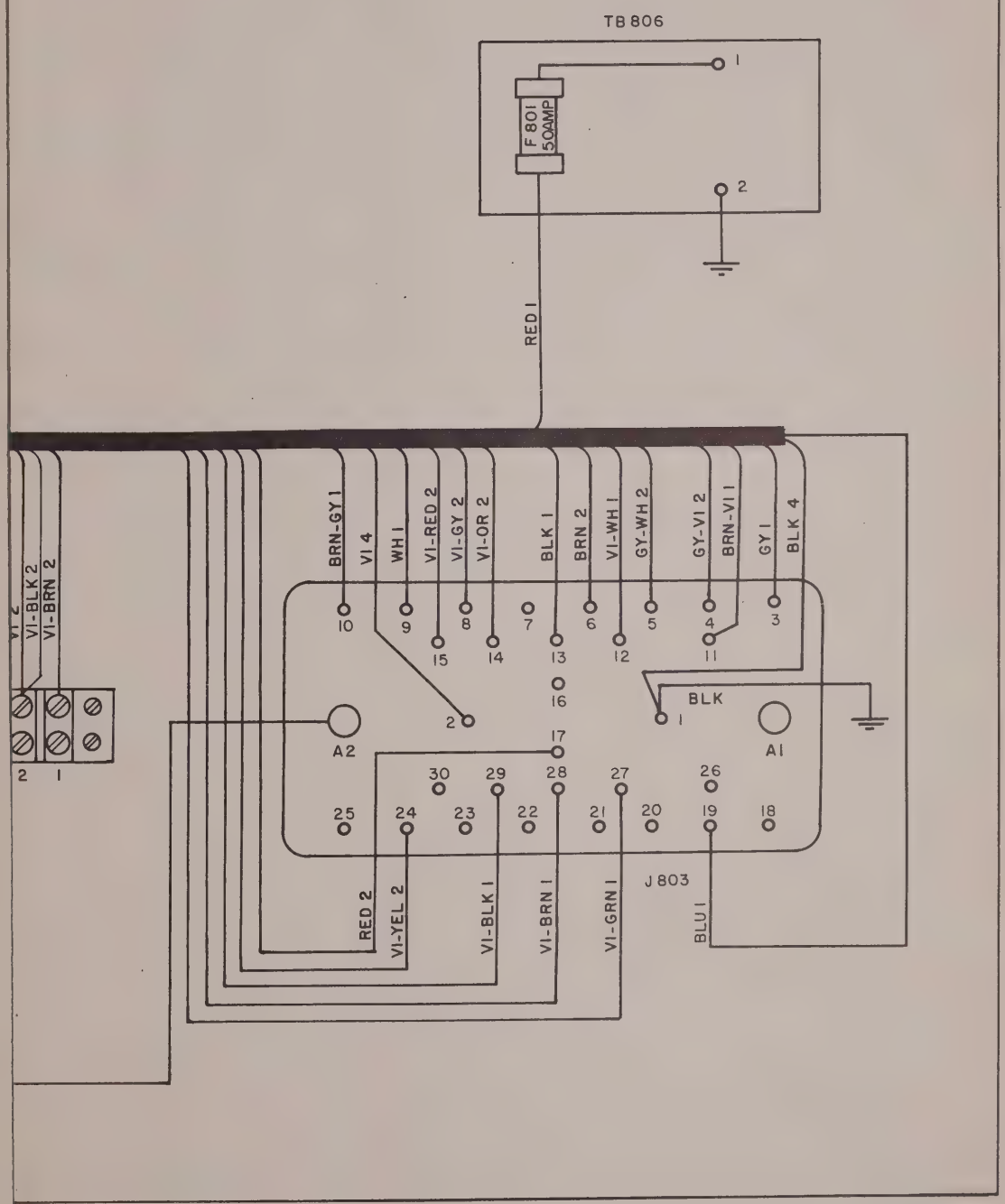


Figure 64. Radio Transmitter T-278/U, schematic diagram.


TB 806
1
2
F 801
50AMP
RED 1
VI-BLK 2
VI-BRN 2
BRN-GY 1
VI 4
WH 1
VI-RED 2
VI-GY 2
VI-OR 2
BLK 1
BRN 2
VI-WH 1
GY-WH 2
GY-VI 2
BRN-VI 1
GY 1
BLK 4
BLK
A2
A1
J 803
RED 2
VI-YEL 2
VI-BLK 1
VI-BRN 1
VI-GRN 1
BLU 1

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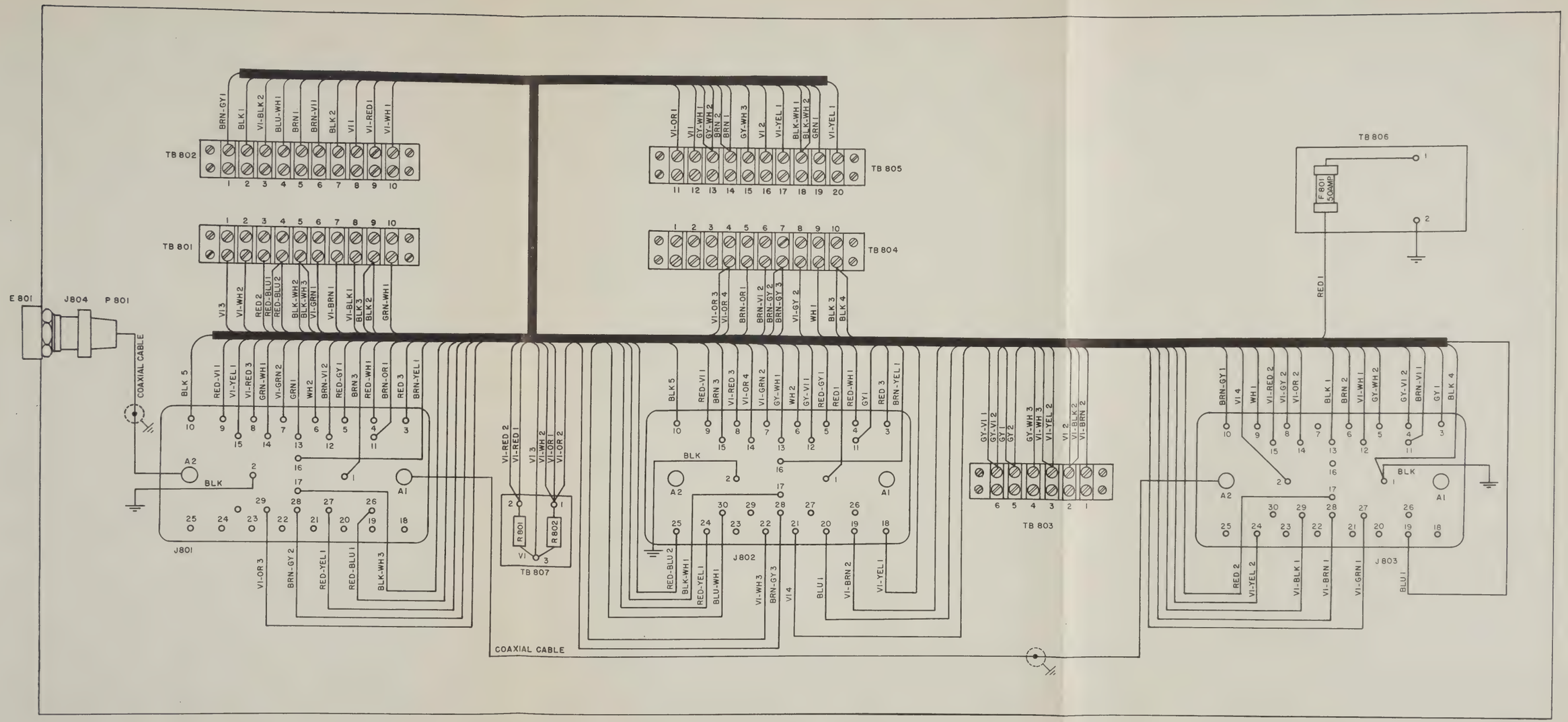
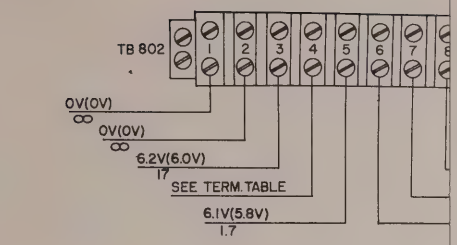
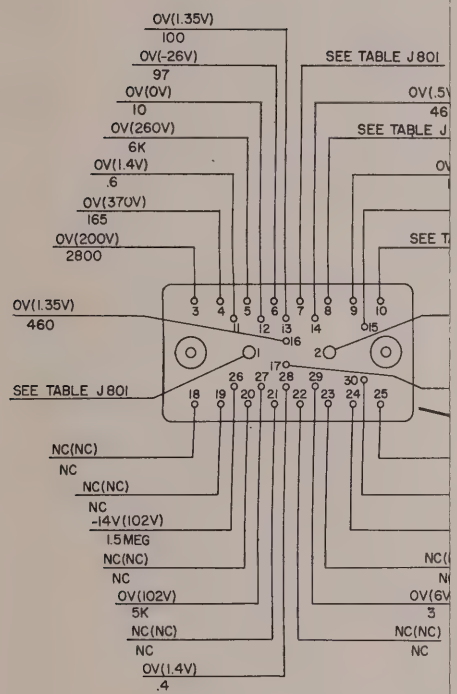
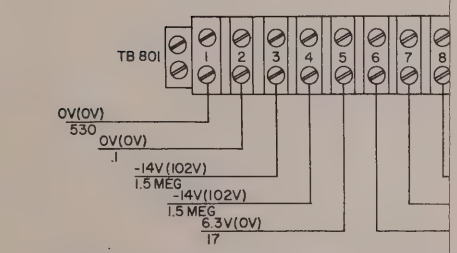


Figure 65. Electrical Equipment Cabinet CY-938/VRC wiring diagram.







NOTES:

1. THE FOLLOWING JUMPERS ARE USED FOR 6-, 12-, AND 24-VOLT OPERATION: 3 AND 4 ON TB 801; 5 AND 6, 8 AND 9 ON TB 802.
2. JUMPER ON TERMINALS 1 AND 2 OF TB 803 USED FOR 6- AND 12-VOLT OPERATION. JUMPER ON TERMINALS 2 AND 3 USED FOR 24-VOLT OPERATION. VOLTAGE AND RESISTANCE MEASUREMENTS MADE WITH THE SPECIFIED JUMPER CONNECTIONS.
3. VOLTA E2 A PUSH VOLT MEAS IS N
4. DISC RESI

TERMINAL BOARD	TERMINAL	24-VOLT SYSTEM			12-VOLT SYSTEM			6-VOLT SYSTEM		
		E_1 (VOLTS)	E_2 (VOLTS)	R (OHMS)	E_1 (VOLTS)	E_2 (VOLTS)	R (OHMS)	E_1 (VOLTS)	E_2 (VOLTS)	R (OHMS)
TB 802	4	0	0	∞	0	12	22	0	0	∞
TB 803	1	0	0	∞	6.3	6	∞	6.3	6	12
TB 803	2	25.2	24	∞	6.3	6	∞	6.3	6	∞
TB 803	3	25.2	24	∞	0	0	∞	0	0	∞
TB 805	17	25.2	24	∞	12.6	12	∞	6.3	6	∞
TB 806	1	25.2	24	∞	12.6	12	∞	6.3	6	∞

TERMINAL	J 801								
	24-VOLT SYSTEM			12-VOLT SYSTEM			6-VOLT SYSTEM		
	E_1 (VOLTS)	E_2 (VOLTS)	R (OHMS)	E_1	E_2	R	E_1	E_2	R
1	0	6.3 AC	1	0	6	.5	0	6.3	.5
7	25.2	24	1	6.3	6	1.6	6.3	6	1.6
8	25.2	24	110	6.3	6	∞	6.3	6	∞
10	0	0	0	0	0	0	0	0	0

TERMINAL	J 802								
	24-VOLT SYSTEM			12-VOLT SYSTEM			6-VOLT SYSTEM		
	E_1 (VOLTS)	E_2 (VOLTS)	R (OHMS)	E_1 (VOLTS)	E_2 (VOLTS)	R (OHMS)	E_1 (VOLTS)	E_2 (VOLTS)	R (OHMS)
1	25.2	24	∞	12.6	12	∞	6.3	6	∞
7	25.2	24	.1	6.3	6	1.6	6.3	6	1.6
8	25.2	24	110	6.3	6	∞	6.3	6	∞
10	0	0	0	0	0	0	0	0	0
15	0	6.3 AC	.1	0	6	.5	0	6	.5
18	25.2	24	∞	12.6	12	∞	6.3	6	∞
19	0	0	∞	6.3	6	∞	6.3	6	12
20	0	0	∞	12.6	12	10	0	0	∞
21	0	0	∞	0	0	∞	6.3	6	1.6
22	25.2	24	∞	0	0	∞	0	0	∞
30	0	0	∞	0	12	22	0	0	∞

TERMINAL	J 803								
	24-VOLT SYSTEM			12-VOLT SYSTEM			6-VOLT SYSTEM		
	E_1 (VOLTS)	E_2 (VOLTS)	R (OHMS)	(VOLTS)	(VOLTS)	(OHMS)	(VOLTS)	(VOLTS)	(OHMS)
2	0	0	∞	0	0	∞	6.3	6	1.6
19	0	0	∞	12.6	12	10	0	0	∞
24	25.2	24	∞	0	0	∞	0	0	∞

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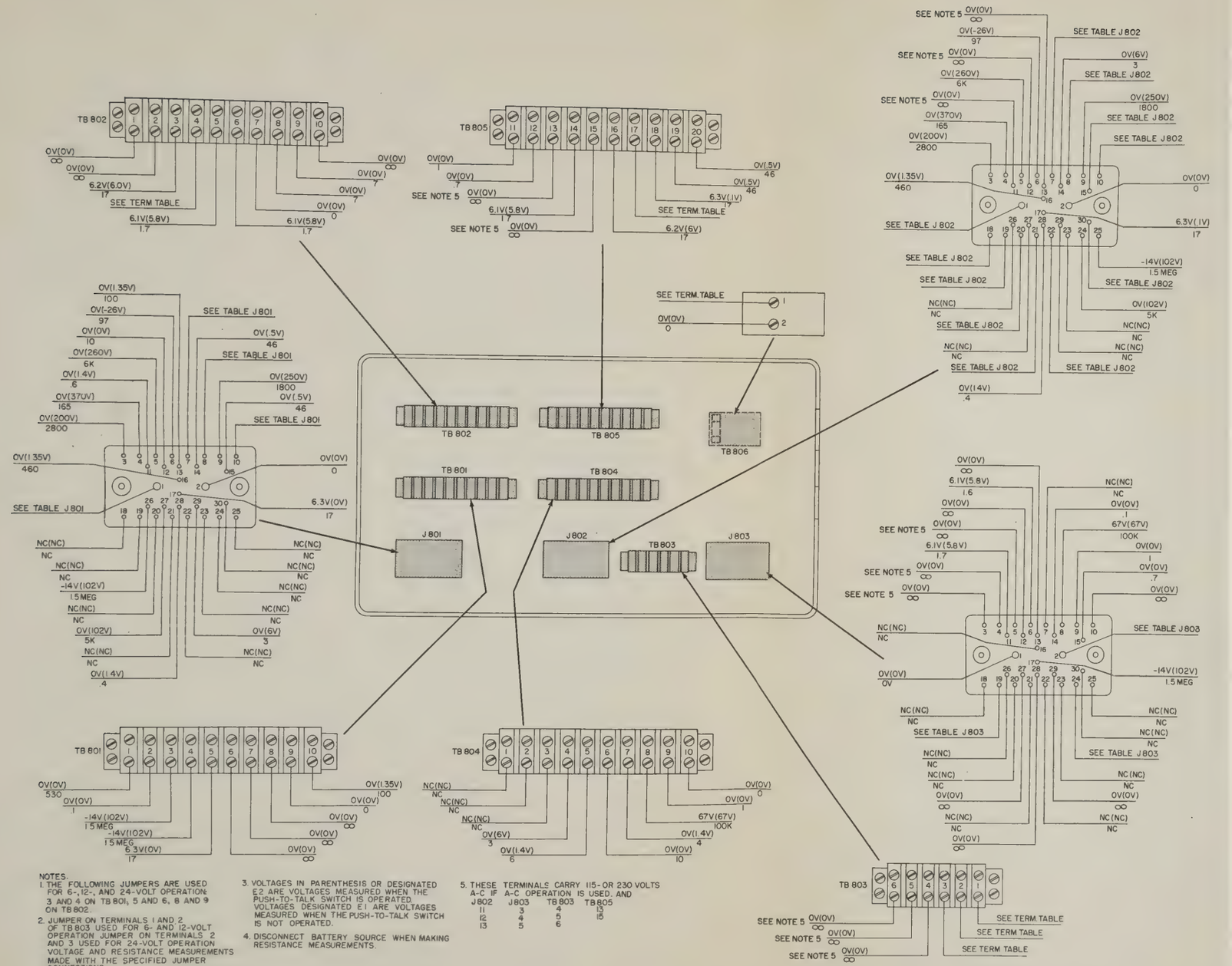
TB 802
TB 805
TB 801
TB 804
TB 806
TB 803
J 801
J 802
J 803
SEE TERM TABLE
SEE TABLE J 801
SEE TABLE J 802
SEE TABLE J 803
SEE NOTE 5
NOTES.
1. THE FOLLOWING JUMPERS ARE USED FOR 6-, 12-, AND 24-VOLT OPERATION: 3 AND 4 ON TB 801, 5 AND 6, 8 AND 9 ON TB 802.
2. JUMPER ON TERMINALS 1 AND 2 OF TB 803 USED FOR 6- AND 12-VOLT OPERATION JUMPER ON TERMINALS 2 AND 3 USED FOR 24-VOLT OPERATION VOLTAGE AND RESISTANCE MEASUREMENTS MADE WITH THE SPECIFIED JUMPER CONNECTIONS
3. VOLTAGES IN PARENTHESIS OR DESIGNATED E2 ARE VOLTAGES MEASURED WHEN THE PUSH-TO-TALK SWITCH IS OPERATED. VOLTAGES DESIGNATED E1 ARE VOLTAGES MEASURED WHEN THE PUSH-TO-TALK SWITCH IS NOT OPERATED.
4. DISCONNECT BATTERY SOURCE WHEN MAKING RESISTANCE MEASUREMENTS.
5. THESE TERMINALS CARRY 115- OR 230 VOLTS A-C IF A-C OPERATION IS USED. AND
J802 J803 TB 803 TB 805
11 3 4 13
12 4 5 15
13 5 6

Figure 66. Electrical Equipment Cabinet CY-938/VRC voltage and resistance diagram.

TERMINAL BOARD	TERMINAL	24-VOLT SYSTEM			12-VOLT SYSTEM			6-VOLT SYSTEM		
		E_1 (VOLTS)	E_2 (VOLTS)	R (OHMS)	E_1 (VOLTS)	E_2 (VOLTS)	R (OHMS)	E_1 (VOLTS)	E_2 (VOLTS)	R (OHMS)
TB 802	4	0	0	∞	0	12	22	0	0	∞
TB 803	1	0	0	∞	6.3	6	∞	6.3	6	12
TB 803	2	25.2	24	∞	6.3	6	∞	6.3	6	∞
TB 803	3	25.2	24	∞	0	0	∞	0	0	∞
TB 805	17	25.2	24	∞	12.6	12	∞	6.3	6	∞
TB 806	1	25.2	24	∞	12.6	12	∞	6.3	6	∞

TERMINAL	J 801								
	24-VOLT SYSTEM			12-VOLT SYSTEM			6-VOLT SYSTEM		
	E_1 (VOLTS)	E_2 (VOLTS)	R (OHMS)	E_1	E_2	R	E_1	E_2	R
1	0	6.3 AC	1	0	6	5	0	6.3	5
7	25.2	24	1	6.3	6	1.6	6.3	6	1.6
8	25.2	24	110	6.3	6	∞	6.3	6	∞
10	0	0	0	0	0	0	0	0	0

TERMINAL	J 802								
	24-VOLT SYSTEM			12-VOLT SYSTEM			6-VOLT SYSTEM		
	E_1 (VOLTS)	E_2 (VOLTS)	R (OHMS)	E_1 (VOLTS)	E_2 (VOLTS)	R (OHMS)	E_1 (VOLTS)	E_2 (VOLTS)	R (OHMS)
1	25.2	24	∞	12.6	12	∞	6.3	6	∞
7	25.2	24	1	6.3	6	1.6	6.3	6	1.6
8	25.2	24	110	6.3	6	∞	6.3	6	∞
10	0	0	0	0	0	0	0	0	0
15	0	6.3 AC	1	0	6	5	0	6	5
18	25.2	24	∞	12.6	12	∞	6.3	6	∞
19	0	0	∞	6.3	6	∞	6.3	6	12
20	0	0	∞	12.6	12	10	0	0	∞
21	0	0	∞	0	0	∞	6.3	6	1.6
22	25.2	24	∞	0	0	∞	0	0	∞
30	0	0	∞	0	12	22	0	0	∞

TERMINAL	J 803								
	24-VOLT SYSTEM			12-VOLT SYSTEM			6-VOLT SYSTEM		
	E_1 (VOLTS)	E_2 (VOLTS)	R (OHMS)	E_1 (VOLTS)	E_2 (VOLTS)	R (OHMS)	E_1 (VOLTS)	E_2 (VOLTS)	R (OHMS)
2	0	0	∞	0	0	∞	6.3	6	1.6
19	0	0	∞	12.6	12	10	0	0	∞
24	25.2	24	∞	0	0	∞	0	0	∞

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APPENDIX II

IDENTIFICATION TABLE OF PARTS

Note: The fact that a part is listed in this table is not sufficient basis for requisitioning the item. Requisitions must cite an authorized basis, such as T/O&E, T/A, SIG 7&8, list of allowances of expendable material, or another authorized supply basis. The Department of the Army Supply Catalog applicable to the equipment covered in this manual is SIG 7&8-AN/VRC-19. For an index of available supply catalogs in the Signal portion of the Department of the Army Supply Catalog, see the latest issue of SIG 1, Introduction and Index.

1. Identification Table of Parts for Radio Sets AN/VRC-19, -19X and 19Y

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
	AN DYNAMOTOR DY-93/U: DC output; 380 v, .180 amp, unregulated; 225 v, .070 amp, unregulated; 225 v, .045 amp, unregulated; 1.3 v, 1 amp, unregulated; 1.3 v, 1 amp, regulated; -25 v, .005 amp, unregulated; DC input; 12 v, 21 amp; 13-13/16" lg x 6-7/8" wd x 6-1/4" h o/a; filter included; rack mtd; tropicalized; Motorola Inc. Part #201V1197.	12-volt power supply for transmitter.	
	AN DYNAMOTOR-POWER SUPPLY DY-98/G: vibrator type synchronous, DC output; 380 v, .180 amp, unregulated; 225 v, .070 amp, unregulated; 225 v, .045 amp, unregulated; 1.3 v, 1 amp, regulated; 1.3 v, .200 amp, regulated; -25 v, .005 amp, unregulated; AC output; 6 v, 2 amp, unregulated; DC input; 24 v, 10 amps; 13-13/16" lg x 6-7/8" wd x 6-1/4" h o/a Filter included; rack mtd; tropicalized; Motorola Inc. Part #201V1076.	24-volt transmitter power supply.	
	AN DYNAMOTOR-POWER SUPPLY DY-100/U: DC output; 380 v, 180 amp, unregulated; 225 v, .070 amp, unregulated; 225 v, .045 amp; unregulated; 6 v, 2 amp, unregulated; 6 v, 3.6 amp, unregulated; 1.3 v, .200 amp, regulated; 1.3 v, 1 amp, regulated; -25 v, .005 amp, unregulated; DC input; 6 v, 40 amp; 13-13/16" lg x 6-7/8" wd x 6-1/4" h o/a; w/ filter; rack mtd; tropicalized; Motorola Inc. Part #201V1081.	6-volt transmitter power supply	3H1535-100
	AN POWER SUPPLY PP-867/U: vibrator type, synchronous; output data, DC; 155 v, .015 amp; 150 v, .005 amp; 140 v, .060 amp; 1.4 volts, 1.25 amp, regulated; -40 v, .5 ma; AC; 6 v, .45 amp; input, DC, 24 v, 1.1 amp; 7" lg x 6-1/4" wd x 5" o/a; filter included; four 8-32 tapped mtg holes on 4-1/4" x 5-9/16" mtg/c; tropicalized; Motorola Inc.	24-volt d-c power supply for receiver.	3H4497-867

1. Identification Table of Parts for Radio Sets AN/VRC-19, -19X and 19Y (cont'd)

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
	Part No. 201V1048. Military Spec No. N-11539 Amendment No. 2.		
	AN POWER SUPPLY PP-869/U: vibrator type; synchronous; DC output data 155 v, .015 amp; 150 v, .005 amp; 140 v, .060 amp; 1.4 v, 1.25 amp, regulated; -40 v, .0005 amp; input data, 6 v DC 3.7 amp; 7" lg x 6-1/4" wd x 5" h o/a; filter included; four 8-32 tapped mtg holes on 4-1/4" 5-9/16" mtg/c; tropicalized; Motorola Inc. Part No. 201V1045.	6-volt d-c power supply for receiver.	3H4497-869
	AN RADIO RECEIVER R-394/U: FM reception; 152 to 174 mc range in 1 band; DC power requirements 155 v, .015 amp; 150 v, .005 amp; 140 v, .060 amp; -40 v, .5 amp; 24 v, .25 amp; 6 v, .9 amp; 6 v, .45 amp; 1.4 v, 1.2 amp; mounts in standard case; 14-1/2" lg x 5-3/4" wd x 8-1/2" h o/a; 22 electron tubes; superheterodyne ckt; c/o 5 plug in units; RF plug-in unit, Motorola Inc. Part #201V1075; 1st IF plug-in unit, Motorola Inc. Part #201V1065; Oscillator plug-in unit, Motorola Inc. Part #201V1078; 2nd IF plug-in unit, Motorola Inc. Part #201V1068; Audio plug-in unit, Motorola Inc. Part #201V1096; Receiver base, Motorola Inc. Part #201V1066; Motorola Inc. Part #201V1098; for communications.	Radio receiver for Radio Sets AN/VRC-19, -19X, and -19Y.	2C4180-394
	AN RADIO TRANSMITTER T-278/U: 152 to 174 mc range, xtal controlled; 30 v, DC 380 v dc, .180 amp; 225 v dc, .070 amp; 200 v dc, .020 amp; 24 v dc, .25 amp; -22 v dc, .005 amp; 6.3 v dc, 2.0 amp; 6 v dc, .9 amp; 2 v dc, .01 amp; 1.3 v dc, .100 amp; 1.25 v dc, .9 amp; 1.25 v dc, .200 amp; 14-1/2" lg x 4-1/2" wd x 8-9/16" h o/a; Motorola Inc. Part No. 201V1122.	Radio transmitter for Radio Sets AN/VRC-19, -19X, and -19Y.	2C6900-278
W 3503	CABLE ASSEMBLY, POWER, ELECTRICAL: Sig C type No. CO-02 HGF (2/4) 1100 2 conductors, stranded, #4 AWG, buna insulated; 600 v max rated working voltage; 16 ft lg o/a; 2 solder lugs Motorola Inc. 929R101 Motorola Inc. Part #230B1018.	Input power cable assembly for Radio Set AN/VRC-19Y.	3E5999-8.35
W 3501	CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL: main body conductor consists of 20 conductors; 4 conductors #16 AWG, 16 conductors #20 AWG, copper, stranded; each conductor 16 conductors 300 v DC wv, and 4 conductors 600 v DC wv; 35-1/8 in. lg main body; 21 term lugs on one end; 20 term. lugs located on other end; Motorola Inc. Part #222A1006; conductors coded by numbered metal band Motorola Inc. Part No. 230D1008.	Used for connecting cabinet and control unit.	3E5999-8.34

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
	AN ELECTRICAL EQUIPMENT RACK MT-1236/VRC: steel; semi gloss enamel; holds case by means of 10 bolts, 5 on each end; bolted to supporting surface; 4 shock mounts between cradle and supporting brackets Motorola Inc. Part #201V1140.	Mounting for Electrical Equipment Cabinet CY-938/VRC.	2Z7383-1236
O 801 thru O 804	MOUNTING: steel and rubber; green enamel finish; 1 mtg bolt; four 0.141 in. mtg holes on 1.0 in. mtg/c; 4 shock mounts between cradle and cabinet bracket; exposed metal portion cad pl and chromated; shock mount for Rack, Electrical Equipment MT-1236/VRC Motorola Inc. Part No. 275A1002.	Shock mounts for Electrical Equipment Rack MT-1236/VRC.	2Z6820.592
	AN RADIO SET CONTROL C-847/U: manual control; c/o 1 vol sw, 1 squelch cont, 1 freq. sw, 1 speaker sw, 1 red and 1 green indicators; zinc base die casting alloy w/OD semi-gloss enamel; 9-3/8 in. lg x 5-13/16 in. wide x 3-9/16 in. high; mounts by one 3/4 in. lg x 3/8 in. wd slot on either side of case; markings; marked spkr, on, off, volume, power, transmit, squelch, off, 1, 2, freq, and handset; waterproof; Motorola Inc. Part #201V1099.	Control for Radio Set AN/VRC-19(*).	2C684-847

2. Identification Table of Parts for Electrical Equipment Cabinet CY-1938/VRC

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
	CABINET, ELECTRICAL EQUIPMENT CY-938/VRC: aluminum, w/semi gloss enamel finish; 18-15/16" lg x 10-3/4" w x 17-7/16" h; has 3 sets of mtg rails and 3 female connectors; has 12 spring catches for holding waterproof covers; 5 holes on each end for attaching to mtg; Motorola Inc. Part No. 201V1138.	Cabinet for Radio Sets AN/VRC-19, -19X, and -19Y.	6F290-938
H801, H802, H803,	CLAMP, ELECTRICAL: ethyl cellulose acetate; no protective finish; no fastening device; 13/16" lg x 1/2" w x 5/16" h o/a; 1 mtg hole for 8-32 screw in base of clamp accommodates material up to 1/4" max dia. Motorola Part No. 242T1002.	Cable clamps.	8P1-101-1
H804, H805	CLAMP, ELECTRICAL: ethyl cellulose acetate; natural finish; 61/64" lg x 1/2" w x 1/2" h o/a; 1 mtg hole .204" dia in base of clamp to hold material 3/8" max dia Motorola, Inc. Part No. 242T1030.	Cable clamps.	2Z2642.434
H806, H807, H808	CLIP: spring lock type; locks chassis mtg bolt in position; beryllium copper; 1-1/32" lg x 3/4" w; max jaw opening .750 in. dia; Motorola Inc. Part No. 242B1050.	Spring lock clips for chassis mounting bolts.	2Z2712.385

2. Identification Table of Parts for Electrical Equipment Cabinet CY-1938/VRC (cont'd)

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
P801	AN RADIO FREQUENCY PLUG UG-88/U: 1 cont. male, round; straight type; over-all dim. 31/32" lg excluding terminals x 27/64" max dia; 52 ohms nominal impedance; cylindrical shape body, brass, w/silver pl finish; locking type; teflon insulation; 1/4" dia max cable opening; one sealing rubber gasket; Motorola Part No. 928R143.	Antenna connector.	2Z7390-88
J 801	CONNECTOR, RECEPTACLE: 32 silver plated contacts, female, rd, polarized, straight type; 3-3/8" lg, x 1-11/16" wide, x 63/64" deep o/a; 28 contacts at 10 amps, 2 contacts at 40 amps; 2 RF contacts w/53.5 ohms nominal impedance rectangular shape body, aluminum alloy, tin plate and clear lacquer finish; mica filled phenolic insert; 1/4" max cable opening; 4 mtg holes ea .144 in. dia, not threaded, 1" by 2-7/8" C to C; contacts supplied with short 90 deg hood for RG-58/U coax; Motorola Part No. 209T1033.	Interconnects transmitter with cabinet.	3Z3082-118
J 802	CONNECTOR, RECEPTACLE: 30 contacts, female, rd; not polarized; straight type; 3-3/8 in. lg x 1-11/16" w x 63/64 in. deep over-all dim. excluding terminals 28 cont rated 10 amp, and 2 cont rated 40 amp rectangular shape body, cast aluminum w/tin plate and clear lacquer finish; mica filled phenolic insert; 4 mtg holes ea. .144 in. dia, not threaded 2-7/8 in. x 1 in. mtg/c; Motorola Part No. 209T1014.	Interconnects transmitter power supply with cabinet	2Z3082-121
J-803	CONNECTOR, RECEPTACLE: 31 silver plated contacts, female, rd polarized, straight type; 3-3/8 in. lg x 1-11/16 in. w x 53/64 in. d o/a; 28 cont at 10 amps, 2 cont at 40 amps 1 r-f cont w/53.5 ohms nominal impedance rectangular body, aluminum alloy w/tin plate and clear lacquer finish; mica filled phenolic insert; 1/4 in. max coaxial cable opening; 4 mtg holes ea .144 in. dia spaced 1 in. by 2-7/8 in. C to C; Cannon Electric Co. Part No. DPD-31C1-33S type L; Motorola Part No. 209T1007.	Interconnects receiver with cabinet	2Z3082-120
J 804	CONNECTOR, RECEPTACLE: 2 contacts, female, rd, straight type; 1-13/32 in. lg excluding terminals x 11/16 in. across flats o/a; R-f connector w/52 ohms nominal impedance cylindrical shape body, brass, silver plated, locking type; teflon insulation; single mtg hole 1/2 in. dia, body threaded w/no. 1/2 in. 20 thd, threaded portion 1/2 in. long; Motorola Part No. 928R148.	R-f feed thru receptacle	2Z3056-21

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
O 805 thru O 816	FASTENER, latch: spring-lock type; cabinet latch; stainless steel w/semi-gloss green enamel finish; 2-1/8" lg x 1-3/8" w x 9/16" d o/a; two 9/64" diam mtg holes spaced 17/32" C to C; Motorola, Inc., Part No. 255T1014.	Cabinet latches for cabinet covers.	6Z3810-115
F 801	FUSE, CARTRIDGE: 50 amp, 125v time delay; 200% for 60 sec and 500% for 7 sec lug type term; 17/32 in. lg x 5/8 in. w x 3/64 in. thick; 17/64 in. wide slot; 1 in. mtg/c enclosed type w/fibre body; one time; non-indicating; 1-3/4" lg x 13/16 dia o/a; thermal cutout; Bussman Mfg. Co. Type No. HSK-50; Motorola Part No. 265T1014.	Primary power source fuse.	3Z2650.13
U803, U804	GASKET: seals cover to cabinet; silicone rubber; tubular shape 54-3/4 in. lg x 3/8 in. OD by 3/16 in. ID; Motorola Inc. Part No. 232B1005.	Seals cover to cabinet.	2Z4866.577
A803	PLATE, aperture: steel, cadmium pl w/semi gloss enamel finish; oval shape 2.562" lg x 1.687" wide x .281" high approx o/a; two .213" diam mtg holes spaced 2.062" C to C; Motorola Inc. Part No. 264B1079.	Cable gland aperture plate.	2Z7090.342
A804	PLATE, APERATURE: outlet for cable; steel, cadmium plated and chromated; 2.875 in. lg x 2 in. wd x .281 in. thk; 2 mtg holes, ea .213 in. dia spaced 2.375 in. C to C Motorola Inc. Part No. 264B1097.	Cable outlet.	2Z7090.341
R801	RESISTOR, FIXED, COMPOSITION: 2200 ohms, 10% tolerance; F characteristic; body dim. excluding terms .468 in. lg x .249 in. dia; insulated; resistant to humidity and salt water immersion; 2 wire lead terms; Motorola Part No. 906R445.	Audio output voltage dropping.	3RC20BF222K
R802	RESISTOR, FIXED, COMPOSITION: .680 ohms +10% tolerance, 1/2 w; F characteristic; .468 in. lg x .249 in. dia body insulated; resistant to humidity and salt water immersion; 2 wire lead terms; Motorola Part No. 906R445.	Audio output voltage dropping.	3RC20BF681K
H812 thru H817	SPRING: helical extension type chassis shock absorber spring stainless steel .063 in dia spring wire 5.437 in. lg x .382 in. diam o/a; 78 turns; RH turns; 90 deg hook terms; Motorola Inc. Part #241B1015.	Shock absorbers for plug in chassis.	2Z8878-107
H809, H810, H811	STUD: steel, cadmium pl and chromated; 1-1/2 in. lg x 3/4 in. dia o/a; one end has 17/32 in. lg w/1/4-20 NC -2 threads, other end 5/8 in. lg w/1/2-20 NF-2 thd; flat side on 1/2 in. dia thd, other end pointed; #246B1042.	Mate with chassis mounting nuts.	6L31148-6

2. Identification Table of Parts for Electrical Equipment Cabinet CY-1938/VRC (cont'd)

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
U801	STUFFING TUBE: terminal type; straight; .687 in. lg x 1.140 in. dia o/a w/out nuts; .830 in. min bore dia; mounted by .140 in. w x .280 in. lg collar; black neoprene; Motorola Inc. Part No. 232B1003.	Waterproofs cable entrance.	2Z4866-573
U802	STUFFING TUBE: terminal type; straight type; .687 in. lg x 1.452 in. dia o/a excl. packing nuts; 1.100 min bore dia; mounted by .140 in. w x .280 in. lg collar; black buna rubber; Motorola Inc. Part No. 232B1006.	Waterproofs cable entrance.	6Z4554-3
TB801	TERMINAL BOARD: phenolic, cellulose filler board; 10 double screw type terms; barrier type; A. 4-3/8 in. lg x 1-3/64 in. wide x 13/32 in. thick o/a; four 5/32 in. mtg holes on 5/16 in. x 4-1/8 in. mtg/c; nickel pl terms; 1. Howard B. Jones Co. Part No. 10-140-3/4 WA; Motorola Part No. 231K1072.	Junction terminal strips.	3Z770-10.35
TB 803	TERMINAL BOARD: molded plastic; 6 double screw type, varnished, nickel pl. terms; barrier type; 2-7/8 in. lg x 1-3/64 in. w x 13/32 in. thick o/a; four .160 in. dia mtg holes on 2-5/8 in. by 5/16 in. mtg/c; Motorola Part No. 231K1043.	Terminal board.	3Z770-6.74
TB806	TERMINAL BOARD: molded plastic: 4 screw type terms; 3-3/16 in. lg x 2 in. w x 11/16 in. thick o/a; 3 mtg holes 3/16 in. dia, spaced 1 in. by 2-15/16 in. C to C; Motorola Inc. Part #246B1039.	Power input terminal block.	3Z770-4.174
TB807	TERMINAL BOARD: phenolic; 3 turret type silver pl. terms; w/o barriers; 1-1/4 in. lg x 7/8 in. w x 35/64 in. h o/a; 2 integral mtg nuts, w/#6-32 thd; spaced 3/8 in. C to C; marked "R801" and "R802" Motorola, Inc. Part #231B1052.	Mounts resistors R801 and R802.	3Z770-3/103
E3542, E3543	TERMINAL, LUG: rd. tongue end type; copper w/tinned finish; #4 AWG wire accommodated; over-all dim. 1-3/8 in. lg x 1/2 in. w x 3/8 in. h o/a; soldered wire connection; one 9/32" mtg hole; Motorola Inc. Part #929R101.	Cable terminal lugs.	3Z12073-68.1
W 3551	CABLE ASSEMBLY, POWER ELECTRICAL: cable data Sig C Type No. Co-212 2 conductors; stranded, 1 No. 8 AWG, 1 shield, buna insulated; 3000 v dielectric test 12 ft. 3 in. lg o/a; 2 solder lugs; Motorola Inc. Part #929R105 conductor stranding; 48 strands #24 AWG, 49 strands #25 AWG; Motorola Inc. Part #230B1019.	Power cable assembly for Radio Set AN/VRC-19.	

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
E3551, E3552	TERMINAL, LUG: rd tongue end type; copper w/tinned finish; #8 AWG wire accommodated; 1-1/4 in. lg x 11/32 in. w x 5/16 in. h o/a; soldered wire connection; one 13/64 in. dia mtg hole; Motorola Inc. Part #929R102.	Cable terminal lugs.	3Z12073-68.2
E3501 thru E3520	TIP, PHONE: rd pin type; brass w/tin plate finish; for #16 AWG wire; 5/8 in. lg x 5/32 in. dia; soldered wire connection; plug-in mtg; Cinch Mfg. Co. Part #10E4715P50; Motorola Part No. 222A1006.	Male terminations for control cable assembly.	2Z9494A-9

3. Identification Table of Parts for Radio Set Control C-847/U

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
H1505 H1512	SCREW, Externally Relieved Body; steel w/cad pl and chromate; Federal Spec No. QQ-S-633 water tight head; reduced shank .135 in. wide x .437 in. lg thread #10-32 NFT, 3/16" lg thd, class 2 fit; 5/8 in. nominal length; head painted green, base of head undercut; Motorola Inc. part #203B1008.	Used to secure radio set control unit cover.	6L4770-10.94
J1501	CONNECTOR, RECEPTACLE; 10 polarized contacts; button type, polarized rd straight type; 1-1/16" lg x 1-9/32" dia o/a; 1 amp, 500 v rms; cylindrical body, stainless steel w/light band blast, locking type; molded Amphenal Blue 1501 insert; mounts in single 1 in. dia hole; body threaded w/#1-18 NF thread 11/16 in. long; 1-9/32 in. O.D. coupling nut; #1-18 NF coupling nut thread; rubber contact plate for waterproofing, contacts spring loaded; American Phenolic Corp. Part #164-7.	Connects handset to radio set control	2Z7250-79
U1501	GASKET: provides waterproof seal for cable thru case; neoprene; single hole; cylindrical shape .687 in. lg by 1.280 in. O.D. by .830 in. I.D; Motorola, Inc. part #232B1003.	Waterproof seal for cable thru case.	2Z4866.573
U1502	GASKET: for use between case and cover; neoprene; 9 holes; rectangular, 7-1/2" lg x 5-3/16" wd x 1/16" thick o/a; Motorola, Inc. part #232C1004.	Provides waterproofing between case and cover.	2Z4866.572
U1503	GASKET: flange gasket; neoprene rubber; 5 holes; 3-7/8" lg x 3-7/8" w x 1/16" thick o/a; 3-3/8" diam. center hole; Motorola, Inc., part #232B1102.	Speaker waterproof seal.	2Z4866.571
H1501, H1502	KNOB: bar; zinc base alloy; green designed to accommodate shaft round double flatted, .250 in. dia, .188 in across flats, .359 in.	Control knobs for speaker and frequency switches.	2Z5822-809

3. Identification Table of Parts for Radio Set Control C-847/U (cont'd)

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
	depth of shaft hole, machine thd. set screw; one straight line marking; 1-15/16" lg x 7/8" w x 15/32" h o/a; luminous marking; Motorola Inc. part #236B1003.		
H1503, H1504	KNOB: round with bar; zinc base die casting alloy; green; rd w/double flats, .250 in. dia, .190 in. across flats, 3/16 in. deep shaft hole, machine thd set-screw to fit .147" dia. hole; no insert; marked with 3 straight lines, 2 on top and 1 on end of bar; 1-3/16" dia x 7/8" h o/a; luminous markings; Motorola Inc. part #236C1001.	Control knobs.	2Z5822-808
I 1501, I 1502	LAMP, INCANDESCENT: 6-8 volts, 1-2 watts, .15 amps; miniature bayonet; bulb T-3-1/4, clear, white; single, tungsten, C-6; 1-3/16 in. lg o/a; 3000 hr rated life; any position; data regarding a "typical mfr" GE #47, Motorola part #965R106.	Indicator lamps.	2Z5952
I1505	LENS, INDICATOR LIGHT: green, 1/2 in. dia, hemispherical type, glass, frosted smooth; 7/16 in. lg x 5/8 in. dia o/a; bezel, brass w/ nickel pl finish; threaded type mtg, 9/16" dia x 5/8" lg; Motorola Part #361T1101.	Cap for indicator light I 1504.	2Z6125-217
I 1506	LENS, INDICATOR LIGHT; red lens, 1/2 in. dia, hemispherical type, glass frosted smooth; 7/16 in. lg x 5/8 in. dia o/a bezel, brass w/ nickel plated finish; threaded type mtg; 9/16 in. dia x 5/8 in. lg; Motorola part #261T1102.	Cap for indicator light I 1503.	2Z6125-216
I 1503	LIGHT, INDICATOR: holds T-3-1/4 lamp; miniature bayonet base; 6 v, .25 amp; aluminum shell w/nickel pl finish; enclosed; 2-1/4 in. lg x 13/16 in. dia o/a; 1 mtg hole required 11/16 in. dia holds up to 5/16 in. thick panel; horizontally mounted; lamp replaceable from front of panel; 2 solder lug terms, both insulated from shell; waterproofed with 3 rubber gaskets; Motorola part #209T1013.	Dial light assembly.	2Z5991-332
I 1504	LIGHT, INDICATOR: accommodates T-3-i/4 lamp, miniature bayonet base; 6 v, .25 amp; aluminum shell w/nickel pl , 2-1/4 in. lg x 13/16 in. dia o/a; 1 mtg 11/16 in. dia; accommodates up to 5/16 in. thick panel; horizontally mounted; lamp replaceable from front of panel; 2 solder lug terms, both insulated from shell; waterproofed with three rubber gaskets; Motorola part #209T1012.	Dial light assembly.	2Z5991-333
LS1501	LOUDSPEAKER, MAGNETIC: permanent magnet field; 8 ohms voice coil impedance; input 3 w peak; diaphragm type 4-1/16 in. h x,	Radio set speaker.	6C43-62

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
	4-1/16 in. w, 2-1/2 in. deep o/a; four #10-24 x 3/4 in. captive screws spaced 3-5/16 in. C to C; waterproofed; blast resistant; Motorola Part #250C1003.		
A1501	PLATE, APERTURE: outlet for cable; steel, w/cadmium pl and chromated; 2-9/16 in. lg x 1-11/16 in. w x 9/32 in. h; 2 mtg holes ea .213 in. dia spaced 2.062 in. c to c; Motorola Inc. part #264B1079.	Cable outlet.	2Z7090.342
R1501	RESISTOR, FIXED, COMPOSITION: 33 ohms, ±10% tolerance, 1/2 w; temp characteristic F; .468 in. lg x .249 in. dia max; insulated, resistant to humidity and salt water immersion; 2 wire lead terms; JAN #RC20BF330K. Motorola part #906R389.	Audio gain attenuator.	3RC20BF330K
R1502, R1503	RESISTOR, FIXED, COMPOSITION: 10 ohms, ±10% 1/2 w; temp characteristic F; .468 in. lg x .249 in. dia max; insulated, resistant to humidity and salt water immersion; 2 wire lead terms; JAN #RC20BF100K; Motorola Part #906R368.	Audio gain attenuators.	3RC20BF100K
R1505	RESISTOR, FIXED, COMPOSITION: 68 ohms, ±10%, 1/2 W; temp characteristic F; .468 in. lg x .249 in. dia max insulated, resistant to humidity and salt water immersion; 2 wire lead terms; JAN RC20BF680K; Motorola Part #906R403.	Audio gain attenuator.	3RC20BF680K
R1506, R1507, R1508. R1510	RESISTOR, FIXED, COMPOSITION; 10 ohms, ±10%, 1 w; temp characteristic F; .750 in. lg x .280 in. dia max; insulated, resistant to humidity and salt water immersion; 2 wire lead terms; JAN RC30BF100K; Motorola part #906R634.	R1506: Audio gain attenuator R1507 and R1508: current limiting resistors for I1501 and I1502 R1510: replaces speaker when not in use.	3RC30BF100K
R1509	RESISTOR, VARIABLE: composition element; resistance and tolerance data 1 sect, 500,000 ohms ±10%, 1/4 w; untapped; std C taper; 3 solder lug terms; enclosed metal case, 15/16 in. dia x 1-3/32" d; metal double flatted shaft, 1/4 in. dia x 7/8 in. lg from mtg surface insulated contact arm mtd by 3/8 in. dia bushing w/32 threads per inch, 3/8 in. lg; single-pole, single throw sw, 3 amp, 125 v ac, normally open, operates at end of rotation, 2 solder lug terms; waterproofed with two "O" rings Motorola Inc. part #218B1003.	Manual squelch control.	3Z7498-50.211
S1501	SWITCH, ROTARY: 1 sect, 5 switching positions; non-pile-up, 2 poles, 5 throws; solid silver alloy contacts phenolic body; 1-11/32	Stepped volume control and power switch.	3Z9825-23.13

3. Identification Table of Parts for Radio Set Control C-847/U (cont'd)

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
	in. lg. x 1-1/4 in. dia; mounts in panel hole by #3/8-32 NEF 2 threaded bushing; double flatted type shaft, 7/8 in. lg; solder lug terms; special features; shaft entry waterproofed; #6-32 threaded hole in end of shaft; dpst rotary snap sw mtd on rear of sect #1, rated 5 amps at 125 v AC; Motorola Inc. part #240B1006.		
S1502	SWITCH, ROTARY: 1 sect; 2 positions; 6 poles, 2 throws; 2 v ac, 60 cycles, .25 amp; momentary action; silver alloy contacts; rear sect phenolic, front pl steel w/ cadmium pl; 7/8 in. lg x 1-1/4 in. dia o/a; mtd by 3/8-32NEF-2 x 3/8 in. lg bushing; flatted type shaft 3/4 in. lg; solder lug terms; 2 waterproofing gaskets, 1 on body and 1 on shaft; locating pin on 17/32 in. radius; shaft has #6-32 tapped hole, 1/4 in. deep in end; Oak part No. 48277-F-1.	Speaker on-off switch.	3Z9825-23.14
S1503	SWITCH, ROTARY: 1 sect; 2 switching positions; 2 poles, 2 throws; solid silver alloy contacts; phenolic body; 7/8 in. lg. x 1-1/4 in. dia; panel mtg hole 3/8 in. dia for #32 NEF 2 thd bushing; double flatted shaft, 3/4 in. lg; solder lug terms; shaft entry waterproofed; No. 6-32 threaded hole in end of shaft; Motorola, Inc. Part No. 240B1005.	Frequency selector switch.	3Z9825-23.12
TB1501	TERMINAL BOARD; phenolic; 10 solder lug terms; 4 in. lg x 1-5/16 in. w x 5/32 in. thick; two .136 in. dia mtg holes spaced 3.312 in. ctoc; 10 terms terminals numbered from 1 to 10; consists of 2 boards held together by eyelets; Motorola Inc. Part No. 231B1037.	Terminal board.	3Z770-10.101
TB1502	TERMINAL BOARD: phenolic 10 solder receptacle type terms, 1 solder lug term; 4 in. lg x 1-5/16 in. w x 9/16 in. h; two .136 in. dia mtg holes spaced 3.312 in. c to c 10 terms numbered from 11 to 20; 1 term attached to corner eyelet; Motorola, Inc. Part No. 231B1039.	Terminal board for control unit.	3Z770-11.37

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